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Aerospace Reports**

STAR

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National Aeronautics and
Space Administration
Langley Research Center

**Scientific and Technical
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Scientific and Technical Aerospace Reports (STAR) is an electronic abstract journal, listing citations with abstracts for aerospace-related reports obtained from worldwide sources. It is electronically published biweekly and announces documents that have recently been entered into the NASA Scientific and Technical Information (STI) Database. The documents are of the following types:

- NASA, NASA contractor, and NASA grantee reports;
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- Translations in report form;
- NASA-owned patents and patent applications
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Also included are two indexes, Subject Term and Personal Author. The Subject Term Index is generated from the *NASA Thesaurus* terms associated and listed with each document.

STAR subject coverage includes all aspects of aeronautics and space research and development, supporting basic and applied research, and applications. Aerospace aspects of Earth resources, energy development, conservation, oceanography, environmental protection, urban transportation, and other topics of high national priority are also covered.

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[Subject Term Index](#)

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Subject Categories of the Division A. Aeronautics

Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- | | | |
|-----------|--|-------------|
| 01 | Aeronautics (General) | 1 |
| 02 | Aerodynamics | 3 |
| | Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information, see also <i>34 Fluid Mechanics and Heat Transfer</i> . | |
| 03 | Air Transportation and Safety | 6 |
| | Includes passenger and cargo air transport operations; and aircraft accidents. For related information, see also <i>16 Space Transportation</i> and <i>85 Urban Technology and Transportation</i> . | |
| 04 | Aircraft Communications and Navigation | 19 |
| | Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information, see also <i>17 Space Communications, Spacecraft Communications, Command and Tracking</i> and <i>32 Communications Radar</i> . | |
| 05 | Aircraft Design, Testing and Performance | 20 |
| | Includes aircraft simulation technology. For related information, see also <i>18 Spacecraft Design, Testing and Performance</i> and <i>39 Structural Mechanics</i> . For land transportation vehicles, see <i>85 Urban Technology and Transportation</i> . | |
| 06 | Aircraft Instrumentation | N.A. |
| | Includes cockpit and cabin display devices; and flight instruments. For related information, see also <i>19 Spacecraft Instrumentation</i> and <i>35 Instrumentation and Photography</i> . | |
| 07 | Aircraft Propulsion and Power | 23 |
| | Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information, see also <i>20 Spacecraft Propulsion and Power</i> , <i>28 Propellants and Fuels</i> , and <i>44 Energy Production and Conversion</i> . | |
| 08 | Aircraft Stability and Control | 25 |
| | Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information, see also <i>05 Aircraft Design, Testing and Performance</i> . | |
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| | Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information, see also <i>14 Ground Support Systems and Facilities (Space)</i> . | |

Subject Categories of the Division B. Astronautics

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| 12 | Astronautics (General) | 29 |
| | For extraterrestrial exploration, see <i>91 Lunar and Planetary Exploration</i> . | |
| 13 | Astrodynamics | 30 |
| | Includes powered and free-flight trajectories; and orbital and launching dynamics. | |
| 14 | Ground Support Systems and Facilities (Space) | N.A. |
| | Includes launch complexes, research and production facilities; ground support equipment, e.g., mobile transporters; and simulators. <i>For related information, see also 09 Research and Support Facilities (Air).</i> | |
| 15 | Launch Vehicles and Space Vehicles | 30 |
| | Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. <i>For related information, see also 20 Spacecraft Propulsion and Power.</i> | |
| 16 | Space Transportation | 31 |
| | Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. <i>For related information, see also 03 Air Transportation and Safety and 18 Spacecraft Design, Testing and Performance. For space suits, see 54 Man/System Technology and Life Support.</i> | |
| 17 | Space Communications, Spacecraft Communications, Command and Tracking | 34 |
| | Includes telemetry; space communication networks; astronavigation and guidance; and radio blackout. <i>For related information, see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.</i> | |
| 18 | Spacecraft Design, Testing and Performance | 35 |
| | Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. <i>For life support systems, see 54 Man/System Technology and Life Support. For related information, see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation.</i> | |
| 19 | Spacecraft Instrumentation | N.A. |
| | <i>For related information, see also 06 Aircraft Instrumentation and 35 Instrumentation and Photography.</i> | |
| 20 | Spacecraft Propulsion and Power | 37 |
| | Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. <i>For related information, see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.</i> | |

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| | Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see <i>27 Nonmetallic Materials</i> . | |
| 25 | Inorganic and Physical Chemistry | 47 |
| | Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also <i>77 Thermodynamics and Statistical Physics</i> . | |
| 26 | Metallic Materials | 61 |
| | Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy. | |
| 27 | Nonmetallic Materials | 75 |
| | Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see <i>24 Composite Materials</i> . | |
| 28 | Propellants and Fuels | 108 |
| | Includes rocket propellants, igniters and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also <i>07 Aircraft Propulsion and Power</i> , <i>20 Spacecraft Propulsion and Power</i> , and <i>44 Energy Production and Conversion</i> . | |
| 29 | Materials Processing | N.A. |
| | Includes space-based development of products and processes for commercial application. For biological materials see <i>55 Space Biology</i> . | |

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Select a category to view the collection of records cited. N.A. means no abstracts in that category.

- | | | |
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| | Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention. | |
| 32 | Communications and Radar | 121 |
| | Includes radar; land and global communications; communications theory; and optical communications. For related information see also <i>04 Aircraft Communications and Navigation</i> and <i>17 Space Communications, Spacecraft Communications, Command and Tracking</i> . For search and rescue see <i>03 Air Transportation and Safety</i> , and <i>16 Space Transportation</i> . | |
| 33 | Electronics and Electrical Engineering | 137 |
| | Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also <i>60 Computer Operations and Hardware</i> and <i>76 Solid-State Physics</i> . | |
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| 35 | Instrumentation and Photography | 162 |
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| 37 | Mechanical Engineering | 176 |
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| 38 | Quality Assurance and Reliability | 179 |
| | Includes product sampling procedures and techniques; and quality control. | |
| 39 | Structural Mechanics | 183 |
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Subject Categories of the Division E. Geosciences

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| | Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see <i>35 Instrumentation and Photography</i> . | |
| 44 | Energy Production and Conversion | 206 |
| | Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geo-physical conversion; and windpower. For related information see also <i>07 Aircraft Propulsion and Power</i> , <i>20 Spacecraft Propulsion and Power</i> , and <i>28 Propellants and Fuels</i> . | |
| 45 | Environment Pollution | 210 |
| | Includes atmospheric, noise, thermal, and water pollution. | |
| 46 | Geophysics | 230 |
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| 47 | Meteorology and Climatology | 237 |
| | Includes weather forecasting and modification. | |
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| 51 | Life Sciences (General) | 253 |
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| | Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals. | |
| 53 | Behavioral Sciences | 268 |
| | Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research. | |
| 54 | Man/System Technology and Life Support | 273 |
| | Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also <i>16 Space Transportation</i> . | |
| 55 | Space Biology | N.A. |
| | Includes exobiology; planetary biology; and extraterrestrial life. | |

Subject Categories of the Division G. Mathematical and Computer Sciences

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| 61 | Computer Programming and Software | 278 |
| | Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM. | |
| 62 | Computer Systems | 302 |
| | Includes computer networks and special application computer systems. | |
| 63 | Cybernetics | 311 |
| | Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also <i>54 Man/System Technology and Life Support</i> . | |
| 64 | Numerical Analysis | 317 |
| | Includes iteration, difference equations, and numerical approximation. | |
| 65 | Statistics and Probability | 324 |
| | Includes data sampling and smoothing; Monte Carlo method; and stochastic processes. | |
| 66 | Systems Analysis | 326 |
| | Includes mathematical modeling; network analysis; and operations research. | |
| 67 | Theoretical Mathematics | 326 |
| | Includes topology and number theory. | |

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- 70 Physics (General) 327**
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- 71 Acoustics 329**
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- 73 Nuclear and High-Energy Physics 335**
Includes elementary and nuclear particles; and reactor theory. For space radiation see *93 Space Radiation*.
- 74 Optics 336**
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Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer*.

Subject Categories of the Division I. Social Sciences

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| 80 | Social Sciences (General) | 358 |
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| 85 | Urban Technology and Transportation | 372 |
| | Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see <i>03 Air Transportation and Safety</i> , <i>16 Space Transportation</i> , and <i>44 Energy Production and Conversion</i> . | |

Subject Categories of the Division J. Space Sciences

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| 89 | Astronomy | 374 |
| | Includes radio, gamma-ray, and infrared astronomy; and astrometry. | |
| 90 | Astrophysics | 375 |
| | Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also <i>75 Plasma Physics</i> . | |
| 91 | Lunar and Planetary Exploration | 377 |
| | Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see <i>18 Spacecraft Design, Testing and Performance</i> . | |
| 92 | Solar Physics | N.A. |
| | Includes solar activity, solar flares, solar radiation and sunspots. For related information see also <i>93 Space Radiation</i> . | |
| 93 | Space Radiation | 378 |
| | Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see <i>52 Aerospace Medicine</i> . For theory see <i>73 Nuclear and High-Energy Physics</i> . | |

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99 General

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- ❶ 19970001126 NASA Langley Research Center, Hampton, VA USA
- ❷ **Water Tunnel Flow Visualization Study Through Poststall of 12 Novel Planform Shapes**
- ❸ Gatlin, Gregory M., NASA Langley Research Center, USA Neuhart, Dan H., Lockheed Engineering and Sciences Co., USA;
- ❹ Mar. 1996; 130p; In English
- ❺ Contract(s)/Grant(s): RTOP 505-68-70-04
- ❻ Report No(s): NASA-TM-4663; NAS 1.15:4663; L-17418; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche
- ❼ To determine the flow field characteristics of 12 planform geometries, a flow visualization investigation was conducted in the Langley 16- by 24-Inch Water Tunnel. Concepts studied included flat plate representations of diamond wings, twin bodies, double wings, cutout wing configurations, and serrated forebodies. The off-surface flow patterns were identified by injecting colored dyes from the model surface into the free-stream flow. These dyes generally were injected so that the localized vortical flow patterns were visualized. Photographs were obtained for angles of attack ranging from 10° to 50°, and all investigations were conducted at a test section speed of 0.25 ft per sec. Results from the investigation indicate that the formation of strong vortices on highly swept forebodies can improve poststall lift characteristics; however, the asymmetric bursting of these vortices could produce substantial control problems. A wing cutout was found to significantly alter the position of the forebody vortex on the wing by shifting the vortex inboard. Serrated forebodies were found to effectively generate multiple vortices over the configuration. Vortices from 65° swept forebody serrations tended to roll together, while vortices from 40° swept serrations were more effective in generating additional lift caused by their more independent nature.
- ❽ Author
- ❾ *Water Tunnel Tests; Flow Visualization; Flow Distribution; Free Flow; Planforms; Wing Profiles; Aerodynamic Configurations*

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SCIENTIFIC AND TECHNICAL AEROSPACE REPORTS

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01 AERONAUTICS (GENERAL)

19980009836 National Aerospace Lab., Tokyo, Japan

Proceedings of the 13th NAL Symposium on Aircraft Computational Aerodynamics

1996; 232p; In Japanese; 13th; NAL Symposium on Aircraft Computational Aerodynamics, 7-9 Jun. 1995, Tokyo, Japan
Report No.(s): PB96-177456; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The proceedings of the 13th NAL Symposium on Aircraft Computational Aerodynamics is presented. The discussion include: Annotated Catalog of some CFD methodology trends for the nineties; 3D-display technology and stereoscopic effect of view; Numerical MPP simulation on compressible fluid; Applications and role of numerical simulation of hypersonic flow for the development of HOPE (H-II Orbiting Plane); Effect of grid quality on the accuracy and convergency of computations; Aerodynamic inverse optimization method for transonic wings; Study on design of helicopter blade for reduction of high-speed impulsive noise; Role of CFD in aeronautical engineering (13)-research of numerical shock front instability; Navier-Stokes simulation for a complete aircraft configuration; and Parallel computation of a tip vortex induced by an aircraft wing.

NTIS

Computational Fluid Dynamics; Numerical Flow Visualization; Turbulent Flow; Mixing Layers (Fluids); Incompressible Flow; Compressible Flow; Conferences

19980010860 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Aviation Contract Maintenance and Its Effects on AH64 Unit Readiness

Evans, Samuel S., Army Command and General Staff Coll., USA; Jun. 07, 1997; 101p; In English
Report No.(s): AD-A331510; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This study investigates the use of contractors to perform aviation maintenance on U.S. Army helicopters. It traces the development of the concept of privatization and the evolution of this process to the point where, currently, many duties formerly performed by soldiers are now the responsibility of contractors. The study analyzes why privatization became necessary in aviation maintenance and analyzes the effects of privatizing AH64 helicopter maintenance using the criteria of training, cost, readiness and deployability. The study concludes that the structure, training requirements and other nonproductive maintenance tasks required of today's soldiers forces commanders to hire contractors to maintain the readiness of the aviation fleet. The study also concludes that contractors are cost effective, when their cost and maintenance production is compared to soldiers. The readiness of aircraft is directly related to the number of maintenance man hours expended and it takes multiple soldiers to equal the production of one contractor. Based on the use of contractors to perform aviation maintenance in many recent contingency deployments, the deployability of contract maintenance is not a problem. The study further concludes that the benefits of contract aviation maintenance can be enhanced if the army formally recognizes the need for contracting and standardizes the program.

DTIC

Aircraft Maintenance; Contingency; Contractors; Cost Effectiveness

19980010951 Office of the Chief of Naval Operations, Washington, DC USA

Naval Aviation: Forward Air Power from the Sea

Jan. 1997; 100p; In English

Report No.(s): AD-A332038; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

For over two hundred and twenty years America's naval forces the Navy and Marine Corps have been forward-deployed, on call and ready to respond. In peacetime, crisis, and conflict we have answered our nation's call on countless occasions in every region of the world. Today, we find ourselves in an era of 'chaotic peace' where the challenges, though sometimes ambiguous, are as daunting as ever. The proliferation of weapons of mass destruction, along with the availability, of sophisticated weapons and commercial information technology on the open markets contribute to uncertain and often dangerous international situations. Our nation's need for unencumbered, forward-deployed, expeditionary forces to provide true flexibility for rapid response will be critical in the 21st century. The unique expeditionary nature of our Service will permit America to respond whenever and wherever America's citizens, friends, and interest are at risk. The expeditionary nature of naval forces means that we will continue to be the force of choice for crisis response.

DTIC

Navy; Military Operations; Armed Forces

19980010972 Vought Corp., Dallas, TX USA

Development of Probabilistic Design Methodology for Composite Structures Final Report, Jan. - Dec. 1994

Gary, P. M., Vought Corp., USA; Riskalla, M. G., Vought Corp., USA; Aug. 1997; 94p; In English

Contract(s)/Grant(s): N00019-18-D-0248

Report No.(s): AD-A331612; DOT/FAA/AR-95/17; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This program was conducted by Vought Aircraft Company, Dallas, Texas, to perform technical studies to aid in the development of a probabilistic design methodology. The foundation of the probabilistic design approach, applied to composite structure, is to base design criteria and objectives on reliability targets instead of factors of safety. Control of the process, in terms of how much it differs from the traditional approach, is maintained by the 'Probability of Structural Failure.' The key technical issues addressed in this contract were the overall assessment of the accuracy of the methodology, current reliability experience, definition of appropriate goals, and database development. The overall assessment of the accuracy of the methodology was done by reviewing current published documents and papers in the probabilistic design field. This review focused on similarities and differences between approaches. The database development was done by visiting airline maintenance depots and naval aviation depots to collect data on structural failures. The analyses of such data produced historical values for aircraft structural reliability. Current structural reliability issues and reliability goals were addressed by analyzing the wing box of the Lear Fan aircraft using Vought's Probabilistic Design Model. Measures of structural reliability such as single flight hour probability of failure for the whole wing box, including upper skin, lower skin, and substructure were produced.

DTIC

Aircraft Maintenance; Technologies; Composite Structures; Structural Reliability; Design Analysis; Reliability Analysis

19980011656 Naval Postgraduate School, Monterey, CA USA

Measuring Customer Satisfaction of Depot Maintenance: An Analysis of Customer Satisfaction of F/A-18 Maintenance at Naval Aviation Depot North Island, CA

Forsyth, Brian A., Naval Postgraduate School, USA; Jun. 1997; 159p; In English

Report No.(s): AD-A331743; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The Department of Defense (DoD) spends about \$15 billion annually on depot level maintenance. About 60 percent of this funding is provided to government owned and operated depots. In light of defense budget downsizing, it has become more critical than ever that depots are run in the most efficient manner possible. DoD has tried to adopt a 'best commercial practices' approach to improve efficiency of depot maintenance. A key focus of commercial practices is delivering customer satisfaction. To this extent, it is imperative that DoD depots understand and properly measure their customer's concerns if they wish to improve their performance. An adaptation of the gaps model, developed by Parasuraman, Zeithaml and Berry in 1985, was used to measure the current customer satisfaction of the NADEP NI F/A-18 aircraft maintenance program. The gaps model measures differences between customer expectations and perceptions of performance of various attributes, and ranks the attributes by importance. A pretest questionnaire was developed and sent out to customers of NADEP NI's F/A-18 aircraft maintenance program in order to evaluate alternative measures of customer satisfaction. Through this process, a tailored set of customer satisfaction measures was developed to provide better feedback to the depot management team and improve the depot maintenance process.

DTIC

Aircraft Maintenance; Military Aviation

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery. For related information see also 34 Fluid Mechanics and Heat Transfer.

19980009948 Army Research Lab., Aberdeen Proving Ground, MD USA

Computational Fluid Dynamics Modeling of Parachute Clusters *Final Report*

Sahu, Jubaraj, Army Research Lab., USA; Benney, Richard J., Natick Research, Development and Engineering Center, USA; Ramakrishnan, Sekaripuram V., Rockwell International Science Center, USA; Nov. 1997; 33p; In English

Contract(s)/Grant(s): DA Proj. 1L1-61102-AH43

Report No.(s): AD-A332229; ARL-TR-1440; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational tool that models the terminal descent characteristics of a single or a cluster of parachutes is a technology that is needed by parachute designers and engineers. As part of a Technology Program Annex (TPA), a joint effort between the U.S. Army Natick Research, Development, and Engineering Center (RRDEC) and the U.S. Army Research Laboratory (ARL) to develop this computational tool is now under way. As a first effort, attempts are being made to analyze both two-dimensional (2-D) and three-dimensional (3-D) flow fields around a parachute using a coupling procedure in which the fluid dynamics are coupled to 2-D and 3-D Structural Dynamic (SD) codes. This effort uses Computational Fluid Dynamic (CFD) codes to calculate a pressure field, which is then used as an input load for the SD code. Specifically, this report presents the methods and results of the flow field plus the structural characteristics of a single axisymmetric parachute and a 3-D gore configuration for the terminal descent velocity. Computed results have been obtained using the payload weight and unstretched constructed geometry of the canopies as input. Significant progress has been made in determining the terminal descent flow field along with the terminal shape of the parachute. A discussion of the fluid and structural dynamics codes, coupling procedure, and the associated technical difficulties is presented. Examples of the codes' current capabilities are shown.

DTIC

Computational Fluid Dynamics; Models; Parachutes; Technologies; Computation

19980009996 Illinois Inst. of Tech., Fluid Dynamics Research Center, Chicago, IL USA

A PIV System for Time-Resolved Measurements at High Reynolds Numbers in the National Diagnostic Facility *Final Report, 15 Mar. 1995 - 14 Mar. 1997*

Wark, Candace, Illinois Inst. of Tech., USA; Naguib, Ahmed, Illinois Inst. of Tech., USA; Fabris, Drazen, Illinois Inst. of Tech., USA; Nagib, Hassan, Illinois Inst. of Tech., USA; Jun. 30, 1997; 5p; In English

Contract(s)/Grant(s): F49620-95-I-0237

Report No.(s): AD-A330735; AFOSR-TR-97-0522; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The necessary equipment for a two camera DPIV system was purchased. It included two cameras, two frame grabbers, a PC based computer, a laser and shutter, optics for the camera, optics for the laser, a workstation for computational processing, and control and signal conditioning electronics. A unique feature of this system is the utilization of special cameras which allow externally synchronized acquisition of two frames separated by only 1- 5 microns, permitting cross-correlation PIV analysis for flows up to 250 m/s. The DPIV system has been put together and tested in the Mark V Morkovin wind tunnel at IIT. Comparison between the statistics of the resulting velocity field and earlier hot-wire measurements in the same wind tunnel reveals the ability of the new DPIV system to provide high spatial resolution measurements with high accuracy. The new system is currently being adapted for use in the National Diagnostic Facility (NDF) at IIT.

DTIC

Two Dimensional Flow; Particle Image Velocimetry; Signal Processing; High Reynolds Number; Velocity Measurement; Flow Velocity

19980010029 Maryland Univ., Dept. of Aerospace Engineering, College Park, MD USA

Rotorcraft Center of Excellence *Final Report, 1 Jul. 1994 - 10 Jul. 1996*

Sep. 1997; 140p; In English

Contract(s)/Grant(s): DAAH04-94-G-0074

Report No.(s): AD-A332060; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The status of a number of rotorcraft research tasks supported under the Army Research Office 'Center of Excellence' program is reported herein. The tasks are grouped under the disciplinary headings of dynamics, flight dynamics, aerodynamics, composite structures, and computational fluid dynamics. For each task an attempt is made to describe the objective of the work, the approach

being taken, the status of the work in terms of recent results, problems or changes in approach or objective, and pertinent abstracts of journal articles or conference papers coming out of the task.

DTIC

Rotary Wing Aircraft; Research

19980010177 Air Force Academy, CO USA

An Investigation of the Flowfield for an Integrated Airframe/Propulsion System *Final Report, 1 Apr. - 30 Sep. 1997*

Kreins, Alois F., Air Force Academy, USA; Oct. 1997; 40p; In English

Contract(s)/Grant(s): F61708-97-W0084

Report No.(s): AD-A332525; EOARD-97-4029; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking USAFA/DFAN as follows: The contractor will modify an existing wind tunnel model of a hypersonic vehicle to incorporate devices that permit control of the onset of boundary layer transition. He will conduct comprehensive wind tunnel tests to determine the effect on the forebody flowfield of fixing the transition location.

DTIC

Flow Distribution; Engine Airframe Integration; Boundary Layer Transition; Hypersonic Flow

19980010453 Tennessee Univ. Space Inst., Tullahoma, TN USA

Large-Vortex Capture by a Wing at Very High Angles of Attack *Final Report*

Wu, J. M., Tennessee Univ. Space Inst., USA; Wu, J. Z., Tennessee Univ. Space Inst., USA; Denny, G. A., Tennessee Univ. Space Inst., USA; Lu, X. Y., Tennessee Univ. Space Inst., USA; Jul. 1996; 47p; In English

Contract(s)/Grant(s): NAG1-1612

Report No.(s): NASA/CR-97-206133; NAS 1.26:206133; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In generating the lift on a wing, the static stall is a severe barrier. As the angle of attack, α , increases to the stall angle, $\alpha(\text{sub stall})$ the flow separation point on the upper surface of the wing moves to the leading edge, so that on a two-dimensional airfoil or a large-aspect-ratio wing, the lift abruptly drops to a very low level. Therefore, the first generation of aeronautical flow type, i.e., the attached steady flow, has been limited to α less than $\alpha(\text{sub stall})$. Owing to the obvious importance in applications, therefore, a great effort has been made in the past two decades to enlarge the range of usable angles of attack by various flow controls for a large-aspect-ratio wing. Basically, relevant works fall into two categories. The first category is usually refereed to as separation control, which concentrates on partially separated flow at α less than $\alpha(\text{sub stall})$. Since the first experimental study of Collins and Zelenevitz, there has been ample literature showing that a partially separated flow can be turned to almost fully attached by flow controls, so that the lift is recovered and the stall is delayed (for a recent work see Seifert et al.). It has been well established that, in this category, unsteady controls are much more effective than steady ones and can be realized at a very low power-input level (Wu et al.; Seifert et al.). The second and more ambitious category of relevant efforts is the post-stall lift enhancement. Its possibility roots at the existence of a second lift peak at a very high angle of attack. In fact, As α further increases from $\alpha(\text{sub stall})$, the completely separated flow develops and gradually becomes a bluff-body flow. This flow gives a normal force to the airfoil with a lift component, which reaches a peak at a maximum utilizable angle of attack, $\alpha(\text{sub m})$ approx. = 40 deg. This second peak is of the same level as the first lift peak at $\alpha(\text{sub stall})$. Meanwhile, the drag is also quickly increased (e.g., Fage and Johansen ; Critzos et al.). Figure 1 shows a typical experimental lift and drag coefficients of NACA-0012 airfoil in this whole range of angle of attack. Obviously, without overcoming the lift crisis at $\alpha(\text{sub stall})$ the second lift peak is completely useless. Thus, the ultimate goal of post-stall lift enhancement is to fill the lift valley after stall by flow controls, so that a wing and/or flap can work at the whole range of 0 deg less than α less than $\alpha(\text{sub m})$. Relevant early experimental studies have been extensively reviewed by Wu et al., who concluded that, first, similar to the leading-edge vortex on a slender wing, the lift enhancement on a large-aspect-ratio wing should be the result of capturing a vortex on the upper surface of the wing; and, second, using steady controls cannot reach the goal, and one must rely on unsteady controls with low-level power input as well. Wu et al. also conjectured that the underlying physics of post-stall lift enhancement by unsteady controls consists of a chain of mechanisms: vortex layer instability - receptivity resonance - nonlinear streaming.

Author

Vortices; Wing Flaps; Angle of Attack; Aerodynamic Drag; Separated Flow

19980010853 Ecole Centrale de Lyon, Ecully, France

Reynolds Stress Transport Equations in the Momentumless Wake of an Axisymmetric Propeller-Driven Body: A Comparison between Experiments and Models

Faure, T., Ecole Centrale de Lyon, France; Robert, G., Ecole Centrale de Lyon, France; 1996; 12p; In English

Report No.(s): PB96-175187; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of the study is to investigate the momentumless axisymmetric wake of a propeller-driven body, where the drag of the body is completely cancelled by the thrust created by the propulsion system. However, for this kind of flow, very few experimental data are available, and no Reynolds stress balances have been published.

NTIS

Reynolds Stress; Turbulent Flow; Reynolds Number; Computational Fluid Dynamics; Propellers; Axisymmetric Bodies; Boltzmann Transport Equation

19980010877 Arizona State Univ., Tempe, AZ USA

Stability of Hypersonic Boundary-Layer Flows Final Report, 15 Oct. 1994 - 17 Apr. 1997

Reed, Helen L., Arizona State Univ., USA; Sep. 1997; 24p; In English

Contract(s)/Grant(s): F49620-95-1-0033

Report No.(s): AD-A329724; AFOSR-TR-97-0501; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Final Report describes our program in studies of (laminar/turbulent) stability and transition in non-equilibrium chemistry flows characteristic of those on the forebodies of hypersonic vehicles. The configuration best modelling a hypersonic vehicle is an elliptic cone. Specifically, we investigated and optimized a Parabolized Navier-Stokes solution for the basic-state flow past a sharp elliptic cone including the region between the wall and the shock. We formulated the Parabolized Stability Equations for 3-D flows.

DTIC

Hypersonic Vehicles; Hypersonic Flow; Turbulent Flow; Boundary Layers; Laminar Flow; Equilibrium Flow

19980011987 California Univ., Dept. of Mechanical and Aeronautical Engineering, Davis, CA USA

Study of the Mutual Interaction Between a Wing Wake and an Encountering Airplane Final Report

Walden, A. B., California Univ., USA; vanDam, C. P., California Univ., USA; Mar. 1996; 91p; In English

Contract(s)/Grant(s): NAG1-1572

Report No.(s): NASA/CR-97-206493; NAS 1.26:206493; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In an effort to increase airport productivity, several wind-tunnel and flight-test programs are currently underway to determine safe reductions in separation standards between aircraft. These programs are designed to study numerous concepts from the characteristics and detection of wake vortices to the wake-vortex encounter phenomenon. As part of this latter effort, computational tools are being developed and utilized as a means of modeling and verifying wake-vortex hazard encounters. The objective of this study is to assess the ability of PMARC, a low-order potential-flow panel method, to predict the forces and moments imposed on a following business-jet configuration by a vortex interaction. Other issues addressed include the investigation of several wake models and their ability to predict wake shape and trajectory, the validity of the velocity field imposed on the following configuration, modeling techniques and the effect of the high-lift system and the empennage. Comparisons with wind-tunnel data reveal that PMARC predicts the characteristics for the clean wing-body following configuration fairly well. Non-linear effects produced by the addition of the high-lift system and empennage, however, are not so well predicted.

Author

Wakes; Vortices; Panel Method (Fluid Dynamics); Potential Flow; Body-Wing Configurations; Configuration Interaction; Computational Fluid Dynamics

19980011994 Wright Lab., Wright-Patterson AFB, OH USA

Computational Fluid Dynamic Analysis of a Single-Engine Business Jet Final Report, Sep. 1995 - Nov. 1996

Wurtzler, Kenneth, Wright Lab., USA; Ansari, Amid, Wright Lab., USA; Dec. 1996; 100p; In English

Contract(s)/Grant(s): AF Proj. 2404

Report No.(s): AD-A332966; WL-TR-97-3046; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This report documents the longitudinal and lateral-directional aerodynamic analysis of a single-engine business jet aircraft. A Euler level analysis was chosen for the evaluation because of the size of the problem (complete aircraft with inlet and nozzle flow simulated) and the relatively large number of runs desired. While Euler analyses ignore viscous effects, it was determined that these effects would be small (except on drag estimates) for the cruise and low-speed flight conditions under consideration. Also, the primary emphasis was on providing incremental effects from a baseline condition, which is more accurate than absolute values. Variation of longitudinal and lateral-direction characteristics with Mach number, angle of attack and control deflections were determined. The maximum Mach number is up to the estimated wing drag divergence Mach number. Integrated force coeffi-

cient data and selected pressure coefficient data are presented. Comparisons with low-speed wind tunnel data are made where appropriate experimental data is available.

DTIC

Computational Fluid Dynamics; Jet Aircraft; Longitudinal Stability; Lateral Stability; Single Engine Aircraft

03

AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents. For related information see also 16 Space Transportation and 85 Urban Technology and Transportation.

19980009270 Eurocontrol Experimental Centre, Bretigny, France

Object Oriented Analysis for Advanced Flight Data Management

Wortmann, J., Eurocontrol Experimental Centre, France; Mar. 1997; 165p; In English

Report No.(s): PB97-159370; EEC-306; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Object-orientation techniques are used in the report to model relevant aspects of Air Traffic Control (ATC) from slot allocation to the arrival at the gate including the main actors - controllers and pilots. Starting with a preliminary class diagram, controller activities during sector hand-over are described with use cases. Object interaction is derived from these use cases leading to a refined analysis model. For the decomposition and modularization of complex use cases, path expressions have been introduced. The object model presented in this report forms a stable and extensible basis for the design and evaluation of new ATC functionality in the areas air navigation, operational procedures and communication facilities. Existing functional specifications can be related to this object model, thus guaranteeing a downward compatibility.

NTIS

Data Management; Flight Management Systems; Air Traffic Control; Object-Oriented Programming; Air Traffic Controllers (Personnel)

19980009916 Nebraska Univ., Aviation Inst., Omaha, NE USA

The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society, Volume 1

Oum, Tae Hoon, Editor, British Columbia Univ., Canada; Bowen, B. D., Editor, Nebraska Univ., USA; Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; 186p; In English; 1997 Air Transport Research Group (ATRG) Conference, 25-27 Jun. 1997, Vancouver, British Columbia, Canada; Sponsored by British Columbia Univ., Canada; Also announced as 19980009917 through 19980009922

Report No.(s): NASA/CR-97-206489; UNOAL-97-2; NAS 1.26:206489; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Topics reported in the proceedings are: (1) Liberalization of Asia-Pacific aviation; (2) Financial analysis of a British Airways/USAir Merger; (3) Strategic alliances in the airline industry; (4) Effect of strategic alliance on performance; (5) Advances, impediments and impacts in an international open skies regime; and (6) Canadian carrier strategies and the 1995 open skies agreement.

CASI

Air Transportation; Airline Operations; Conferences; International Cooperation; Government/Industry Relations; Commercial Aircraft; Information Transfer

19980009917 Japan Air Lines Co. Ltd., Tokyo, Japan

Initiatives for Liberalization in Asia-Pacific Aviation

Nagata, Koki, Japan Air Lines Co. Ltd., Japan; Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 1; 6p; In English; Also announced as 19980009916; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

The report presents an overview of how Japan Airlines sees the current state of US/Japan aviation relations, in the light of the current "Open Skies" policy of the USA with regard to Asia.

Derived from text

Airline Operations; Civil Aviation; Commercial Aircraft; Air Transportation; Passenger Aircraft; International Cooperation

19980009918 Dubuque Univ., Dubuque, IA USA

British Airways/USAir Merger: Financial and Traffic Analysis

Abraham, Edward H., Dubuque Univ., USA; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG)

of the WCTR Society; Sep. 1997; Volume 1, No. 1; 16p; In English; Also announced as 19980009916; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

By late March 1993, the US Department of Transportation (DOT) and the Justice Department agreed to allow British Airways to purchase a 25% equity interest in USAir, with a 21 % voting interest and code-sharing rights. This paper previews the history and background of the involved carriers, rationale of mergers, and the consequences of airline mergers and alliances. Part H of this paper evaluates pre- and post-alliance traffic statistics and financial performance in great detail. This study examines the relative changes in traffic and profits on British Airways and USAir Group, Inc. Despite the consumer-led recession in 1988 and other social factors, it was found, subjectively, that USAir's management achieved a successful implementation of the cost reduction program announced in late 1991, a new labor agreement was reached with major organized employee groups, and a significant accomplishment was achieved by reducing expenditure. The alliance between USAir and British Airways offered travelers the most benefits of any global airline partnership.

Author

Airline Operations; Cost Reduction; Air Traffic; Cost Analysis; Air Transportation

19980009919 Embry-Riddle Aeronautical Univ., Business Administration Dept., Daytona Beach, FL USA

A Typology of Strategic Alliances in the Airline Industry: Propositions for Stability and Duration

Rhoades, Dawna L., Embry-Riddle Aeronautical Univ., USA; Lush, Heather, Embry-Riddle Aeronautical Univ., USA; Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 1; 20p; In English; Also announced as 19980009916; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

While strategic alliances have become commonplace in the airline industry, the stability and performance of these alliances remains questionable. In this article, the authors review the structure of recent alliances in the airline industry and propose a typology of alliances based on two key dimensions: commitment of resources and complexity of arrangement. Using this typology, the authors derive a series of propositions on the stability and duration of various types of alliances.

Author

Airline Operations; Industries; Agreements; Civil Aviation

19980009920 New York Univ., Dept. of International Business, New York, NY USA

The Effect of Strategic Alliance on Performance: A Study of International Airline Industry

Park, Namgyoo, New York Univ., USA; Cho, Dong-Sung, Seoul National Univ., Korea, Republic of; Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 1; 33p; In English; Also announced as 19980009916; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

This study investigates codesharing alliances to see if they increase market shares of the carriers involved by analyzing a time-series data of fifty six airlines over the 1986-93 period. Our empirical results indicate: (a) codesharing, in fact, increases the carriers' market shares; (b) codesharing between existing airlines increase market shares less than those between relatively new carriers; and (c) the market-share-increasing effect of codesharing alliances is higher in markets with fewer competing carriers.

Author

Airline Operations; Market Research; Industrial Management; Time Series Analysis

19980009921 Seattle Univ., Albers School of Business and Economics, WA USA

Towards an International Open Skies Regime: Advances, Impediments, and Impacts

Toh, Rex S., Seattle Univ., USA; Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 1; 23p; In English; Also announced as 19980009916; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The International Air Transportation Competition Act of 1979 heralded the era of open Skies in international aviation. This paper traces the post-war regulation and then deregulation of fares, rates, routes, and capacity all the way from Bermuda I through the partial dismantling of the IATA (International Air Transport Association) price fixing apparatus, discusses the impediments to Open Skies, and examines the impact on the IATA.

Author

Air Transportation; International Cooperation; Civil Aviation

19980009922 Kaduck (Raymon J.), Yellowknife, Northwest Territories Canada

Canadian Carrier Strategies and the 1995 Open Skies Agreement

Kaduck, Raymon J., Kaduck (Raymon J.), Canada; Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 1; 36p; In English; Also announced as 19980009916; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The Canada-US "Open Skies" negotiation took place during a brief period which spanned the fall of 1994 and early 1995. It was conducted first through personal representatives, and later in formal bargaining sessions. After nearly 30 years of acrimonious exchanges between the two governments, the 1995 agreement was concluded with surprisingly little difficulty, and has ushered in a new era in transborder air transport. This paper draws heavily on research presented in a longer paper entitled Break in Overcast. The Negotiation of the 1995 Canada-US Open Skies Agreement, which discussed the dynamics of the negotiations in 1991-92 and 1994 Elliot-Kaplan talks. The current paper focuses on Canadian carrier strategy before and after the agreement.

Author

Air Transportation; Agreements; Policies; Strategy

19980010040 General Accounting Office, Resources Community and Economic Development Div., Washington, DC USA

FAA Oversight of Repair Stations Needs Improvement

Oct. 1997; 95p; In English

Report No.(s): AD-A331829; GAO/RCED-98-21; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

As the size of the airline and air cargo industries has grown, so has the reliance on repair stations. In 1990, repair stations performed 37 percent of air carriers' maintenance; by 1996, the figure was 46 percent. More than 2,500 domestic and 270 foreign repair stations do work for air carriers. FAA's certification process establishes what the repair stations are qualified to do. While many repair stations have fewer than 15 employees and a limited range of activities that FAA has certified, some employ thousands of workers who completely overhaul engines and renovate aging airframes for additional years of service. FAA'S inspection activities are aimed at ensuring that repair stations are still meeting the certification requirements. FAA had about 3,000 inspectors in fiscal year 1997. About 600 of them were involved in repair station inspections. FAA'S guidelines require that each repair station be inspected at least once a year. These inspections involve checking such matters as whether repair station staff have the appropriate qualifications to do the work and whether repair procedures meet FAA regulations. About 550 inspectors oversee repair stations located in the USA, usually through inspections conducted by individual inspectors. For larger facilities, these inspections may take place over several visits. Most of the inspectors are responsible for several repair stations as well as other types of operations, such as helicopter operators and training schools for pilots and mechanics.

DTIC

Safety; Shops; Maintenance; General Aviation Aircraft

19980010259 Nebraska Univ., Aviation Inst., Omaha, NE USA

Journal of Air Transportation World Wide, Volume 2

Bowen, Brent, Editor, Nebraska Univ., USA; Journal of Air Transportation World Wide. Volume 2, Number 1; Nov. 1997; ISSN 1093-8826; 104p; In English; Also announced as 19980010260 through 19980010266

Report No.(s): NASA/TM-97-112609; NAS 1.15:112609; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Journal of Air Transportation World Wide's (JATWW) mission is to provide the global community immediate key resource information in all areas of air transportation. Our goal is to be recognized as the preeminent scholarly journal in the aeronautical aspects of transportation. As an international and interdisciplinary journal, the JATWW will provide a forum for peer-reviewed articles in all areas of aviation and space transportation research, policy, theory, case study, practice, and issues. While maintaining a broad scope, a key focal point of the journal will be in the area of aviation administration and policy.

Derived from text

Information Systems; Air Transportation; Policies; Space Transportation; Transportation; Resources

19980010262 Maryland Univ., Princess Anne, MD USA

Safety Concerns of Startup Airlines

Wilson, Marc, Maryland Univ., USA; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 38-46; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Startup airlines which do not have sufficient capital are forced to acquire older aircraft and contract out maintenance, crew training, and operation management. These factors can contribute to the poorly supervised practices as illustrated in this case study

of the crash of a ValuJet DC-9 on May 11, 1996. The areas of focus are aircraft age, maintenance, safety record, cargo handling, and crew resource management.

Author

Airline Operations; Aircraft Maintenance; Safety; Service Life; Resources Management; Maintenance Training; Crashes; Materials Handling

19980010264 Wichita State Univ., Wichita, KS USA

International Airline Quality Measurement

Headley, Dean E., Editor, Wichita State Univ., USA; Bowen, Brent D., Editor, Nebraska Univ., USA; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 55-63; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

Historically, airline quality has been measured through the use of surveys that ask the consumers to make a comparison between expectations and outcomes. This method was informative but very cumbersome in a rapidly changing environment. This paper outlines the efforts of the consumer researchers to develop a weighted, consumer oriented rating scale for the U.S.A. domestic airline industry as an alternative to survey-based rating scales. The Airline Quality Rating (AQR) approach has been successfully employed in the United States by the major airlines and by the general public. Development considerations are offered for facilitating the adaptation of the AQR's weighted average approach to the world airline industry.

Author

Airline Operations; Consumers; Commercial Aircraft; Ratings; Civil Aviation

19980010783 Nebraska Univ., Aviation Inst., Omaha, NE USA

The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society, Volume 1

Oum, Tae Hoon, Editor, British Columbia Univ., Canada; Bowen, Brent D., Editor, Nebraska Univ., USA; Sep. 1997; 242p; In English; 1997 Air Transport Research Group Conference, 25-27 Jun. 1997, British Columbia, Vancouver, Canada; Sponsored by British Columbia Univ., Canada; Also announced as 19980010784 through 19980010794

Report No.(s): NASA/CR-97-206488; UNOAI-97-3; NAS 1.26:206488; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Topics included in the proceedings are: The effect of liberalized air transport bilaterals; cost competitiveness of major airlines; economic effects of duopoly competition in Korea; transforming Canada's aviation regulations; liberalization in Europe; airline labor cost in a liberalized Europe; noncooperative collusion; European air transport deregulation; public ownership and deregulation in the Scandinavian airline industry; airline competition between London and Amsterdam; and a banker's view of the European airline industry.

CASI

Air Transportation; Airline Operations; Civil Aviation; Competition; Conferences; Labor; Regulations; Operating Costs

19980010784 Maryland Univ., College of Business and Management, College Park, MD USA

The Effect of Liberalized Air Transport Bilaterals on Foreign Visitor Volume and Traffic Diversion: The Case of Canada

Dresner, Martin, Maryland Univ., USA; Oum, Tae Hoon, British Columbia Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society Vol.-1-2; Sep. 1997; Volume 1, No. 2; 34p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper investigates the effects of Canada's 'facilitating' bilateral air agreements, with the UK, the Netherlands and Germany, on the volume of visitors from those countries to Canada, and the effects of the U.S. 'liberal' bilateral air agreements on diverting Canadian foreign visitors away from direct routes to routes that transit the U.S. These objectives are accomplished by estimating visitor volume models (direct volume to Canada, and total volume including via-US routing) and direct-routing share models on a panel data of 22 countries for the 1975-94 period. The empirical results can be summarized as follows: Canadian facilitating bilaterals have had significant positive effects on increasing the number of DIRECT visitors to Canada. Although magnitudes of the effects vary between the alternative models, the most reliable empirical result indicates that Canada's facilitating bilaterals have increased both the DIRECT and TOTAL visitors by about 20% from those countries that signed these agreements with Canada. The US liberal bilaterals did not have statistically significant effects on the DIRECT or TOTAL volume of foreign visitors to Canada. However, the US liberal bilaterals have had a moderate but statistically significant negative effect on the share of DIRECT visitors to Canada. The average effect of the US liberal bilateral with a country was to reduce Canada's DIRECT visitor share from that country by 3.1%.

Author

Agreements; Air Transportation; Air Traffic

19980010785 British Columbia Univ., Faculty of Commerce and Business Administration, Vancouver, British Columbia Canada

Cost Competitiveness of Major Airlines: An International Comparison

Oum, Tae Hoon, British Columbia Univ., Canada; Yu, Chunyan, British Columbia Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 34p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper measures and compares the unit cost competitiveness of the world's major airlines, using the yearly panel data of 23 firms over the 1986-93 period. First, we develop a unit cost index for aggregate output which is computed via a multilateral index procedure. A translog variable cost function is estimated and used to decompose the unit cost differentials into potential sources: input prices, network and output attributes, and efficiency. The results of the unit cost decomposition are used to construct a cost competitiveness indicator after removing the effects of network and output attributes. This indicator allows one to compare the true cost competitiveness of airlines in a given market, especially in an inter-continental market, and shows what factors are contributing or harming a carrier's cost competitiveness. In addition, the effect of exchange rate fluctuation on unit cost is examined via case studies of JAL and Lufthansa. Our results for 1993 are: (a) Asian carriers (except JAL and ANA) are generally more cost competitive than the major US carriers, mostly due to their substantially lower input prices; (b) JAL and ANA are over 50% less cost competitive than AA mainly because of their high input prices; (c) major European carriers are 7% (BA) - 42% (SAS) less cost competitive than AA, because of higher input prices and lower efficiency; (d) among the U.S. carriers, AA, UA and Delta are similar in cost competitiveness, while NW and CO enjoy, respectively, 5% and 12% cost competitiveness over AA. US Air is least cost competitive among the North American carriers; (e) exchange rate fluctuation has had considerable effects on some carriers' costs. In particular, JAL, and, to a lesser degree, Lufthansa's less cost competitive position is largely attributable to appreciation of their home currencies.

Author

Airline Operations; Civil Aviation; Operating Costs; Cost Analysis; Competition; Air Transportation; Cost Effectiveness

19980010786 Korea Transport Inst., Seoul, Korea, Republic of

An Economic Effect of Duopoly Competition in Domestic Air Transport Markets in Korea

Kim, Jongseok, Korea Transport Inst., Korea, Republic of; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 18p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper examines competition patterns in the domestic air transport industry and its performance in terms of consumer surpluses of passengers in Korea using suitable economic models.

Author

Air Transportation; Competition; Market Research; Civil Aviation; Aircraft Industry

19980010787 Transport Canada, Ottawa, Ontario Canada

Transforming Canada's Aviation Regulations

Rohr, Ray, Transport Canada, Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 6p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Since 1991, Transport Canada's civil aviation regulation program has undergone a dramatic transformation. This has been achieved in partnership with its principal clients - Canada's aviation community. Working more closely with those in the aviation community to create a climate that enhances safety is not a revolutionary concept, but some of the philosophies and processes may be interesting to others involved in a similar endeavor. Historically, the primary role of the regulator has been one of "establisher and enforcer" of regulations. This model is not conducive to innovation or change. Unfortunately, it is one that is pervasive not only in government itself, but also in those it serves. The cornerstone of the new Canadian aviation regulation model is "mutual respect and trust" between Transport Canada Civil Aviation directorate and the aviation community. The impetus for transforming the aviation regulation program was, and continues to be, provided by both externally driven factors (i.e., international efforts to harmonize aviation regulations) and internally driven factors (i.e., an overall shift in the federal public service to a focus on client needs). Also, the impact of the recent Canadian government downsizing initiatives cannot be ignored. As a result of these initiatives, the Canadian air navigation system was commercialized and other structural changes were made to Transport Canada. Throughout the process, maintaining aviation safety was of paramount importance. This time of transition provided an ideal opportunity to find new ways to meet safety objectives.

Author

Civil Aviation; Regulations; Air Transportation

19980010788 Cranfield Univ., College of Aeronautics, Bedford, UK

Air Transport Liberalisation in Europe: The Progress So Far

Morrell, Peter, Cranfield Univ., UK; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 20p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In April 1997, the final phase of a series of measures were implemented, which were aimed at liberalising air transport within the European Union (EU). These measures were introduced on a phased basis, the first package coming into force in 1988, the second in 1990, and the most significant third package in 1993 (which included a delayed 1997 lifting of cabotage protection). These applied on a multilateral basis within the European Community (with some exclusion clauses), and followed progress towards liberalisation on a bilateral basis between 1985 and 1988, most notably on routes between the UK and a number of EU countries. This paper examines the progress so far in the achievement of liberalisation and greater competition within Europe. It is based on extensive research carried out by the author and a team from Cranfield University over 1995 and 1996. This included desk research, a survey of and interviews with EU airlines and aviation authorities, and five more detailed airline case studies. This has been updated by the author to take into account more recent developments, especially regarding new entrant airlines. Some of the expectations following the introduction of EU liberalisation have not been met: there have been few serious challenges to the flag carrier duopolies, there has been a consolidation of the position of airlines the major airlines in their home markets, and business and fully flexible fares have continued to climb. However, many of the airlines' strategic changes were more in response to developments in global rather than EU markets. On the other hand, consumers have benefited from greater competition in promotional fares, and more dynamic pricing tactics overall have led to higher intra-EU traffic growth in the early 1990s than would have been the case without liberalisation. There was also a substantial growth in the number of EU cities served by non-stop services, and some encouraging trends from new entrant airlines in some countries. On balance, it is argued that the net result has been disappointing; but this is hardly surprising given the timing of the final stage of liberalisation in the middle of an economic recession, the concern of the larger airlines with more global events, and the time needed to change some of the more deep-seated structural barriers, such as airport slot availability, input market monopolies and state aids.

Author

Air Transportation; Airline Operations; Civil Aviation; Market Research

19980010789 Cranfield Univ., Coll. of Aeronautics, Bedford, UK

Airline Labour Cost in a Liberalised Europe

Alamdari, Fariba, Cranfield Univ., UK; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 20p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Following the liberalisation of air services in Europe since 1988, and more liberal agreements with countries outside Europe, mainly with the US, European carriers have become under an increasing pressure to reduce costs. This has been in response to the growing competition in their markets from fellow European carriers and the US airlines. The most obvious area of costs for airlines to tackle has been labour. This paper analyses trends in the numbers of employees, labour wages (labour costs per employee) and labour unit costs (labour expenses per available tonne kilometre) of European carriers from 1985 to 1995. In comparing the airlines' performance in relation to labour costs the analysis takes into account the differences in the costs of living in carriers' countries, and compares the employees' average take-home pay. It also compares airline and manufacturing labour pay. The results indicate that European airlines reduced unit labour costs by productivity increases, partially offset by increases in real wage levels. Once taxes and social costs are deducted from labour costs there appears to be a large difference in what employees take home, depending on which country they are based. It was also found that almost all the airlines in the sample pay their employee on average more than those working in their respective countries' manufacturing industry but the gap between the two was narrowing. It is recommended that to achieve reduction in real wage levels and further improvements in productivity, incentives policies such as profit sharing or employee share ownership could perhaps become more effective.

Author

Airline Operations; Civil Aviation; Costs; Labor; Cost Analysis

19980010790 Geneva Univ., Geneva, Switzerland

Partial Versus Complete Liberalisation in the European Airline Industry: Which Scenario is More Likely to Facilitate Noncooperative Collusion?

Nero, Giovanni, Geneva Univ., Switzerland; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 22p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper combines the strategic effects that arise from repeated interactions among airlines with specific features of the European airline industry. In particular, the paper gives some insights into why European flag-carriers seem reluctant to fully exploit the more liberal regulatory rules which provide larger entry opportunities into new intra-European markets. To this end, I present a model which shows under which conditions the European airline industry is more likely to sustain a noncooperative 'mutual forbearance' equilibrium.

Author

Airline Operations; Civil Aviation; International Cooperation; Regulations

19980010791 Universidad de Las Palmas de Gran Canaria, Dept. of Applied Economics, Las Palmas, Spain

European Air Transport Deregulation: A Panel Data Approach

Betancor, Ofelia, Universidad de Las Palmas de Gran Canaria, Spain; Campos, Javier, Universidad de Las Palmas de Gran Canaria, Spain; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 20p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this paper we present a first attempt of empirical analysis for the period 1986-1994 of the effects of the deregulation process carried out in the European air transport industry. Using individual data for 44 city-pair intra-EU scheduled routes, we estimate different price equations in order to assess the relevance both of the deregulation packages of 1987, 1990 and 1992 released by the European Commission and the liberal bilateral agreements that several countries had agreed upon before. We use panel data techniques to discard unobservable individual effects related to route-traffic characteristics. Our results support the idea that the effect on the fare level of the deregulation process pursued by the European Commission has been weaker than the corresponding effect of the bilateral agreements. As in the US case, another striking effect of the deregulation process has been the proliferation of discount tariffs.

Author

Air Transportation; Policies; Regulations; Economic Analysis; Data Reduction

19980010792 Agder Coll., Center for International Economics and Shipping, Kristiansand, Norway

The Effect of Public Ownership and Deregulation in the Scandinavian Airline Industry

Randoy, Trond, Agder Coll., Norway; Stranden, Siri Pettersen, Norwegian School of Economics and Business Administration, Norway; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 14p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

We analyse why deregulation resulted in a temporary strong reduction in prices in Sweden, whereas in Norway the prices did not change significantly. SAS and Linjeflyg merged when the Swedish market was deregulated, whereas attempts to merge SAS and Braathens SAFE did not succeed. Upon deregulation in Sweden some of the carriers operating charter markets or regional secondary routes decided to enter the main routes. This put pressure on prices. Similar entries did not take place in the Norwegian market. We analyse whether the duopoly between SAS and Braathens SAFE is characterised by tacit collusion.

Author

Airline Operations; Market Research; Regulations; Cost Analysis; Civil Aviation

19980010793 Department of Civil Aviation, An Hoofddorp, Netherlands

Airline Competition on the Route Between Amsterdam and London

Uittenbogaart, Peter, Department of Civil Aviation, Netherlands; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 13p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

With granting all Airlines of the European Economic Area (EEA) cabotage rights, enabling them to fly between any two domestic points within the 17 EEA states, liberalization in European air transport business was formally completed in April 1997. However, the free market effects of abandoning the bilateral system are not yet very manifest today. Since the Third Package came into effect in 1992, the number of international routes in the European Union hardly changed. Until now, lifting barriers to market entry, did not cause a significant influx of new competitors on direct routes. The number of airport-to-airport routes served by more than two carriers increased from 4% at the beginning of 1992 to only 6% at the beginning of 1996. Remarkably the number of airport-to-airport routes where two carriers compete dropped from 40% at the beginning of 1992 to 30% at the beginning of 1996. The obvious conclusion is that since the third package entered into force, the number of monopoly routes jumped from 56% at the beginning of 1992 to 64% at the beginning of 1996.

Author

Air Transportation; Airline Operations; Civil Aviation; Competition

19980010794 ABN AMRO Bank, Amsterdam, Netherlands

The European Airline Industry: A Banker's View

Smit, Hans G., ABN AMRO Bank, Netherlands; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 1, No. 2; 13p; In English; Also announced as 19980010783; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

For those institutions which finance the aerospace industries, it is useful to estimate what the consequences will be of the present liberalisation process which has beset the European airline industry. Consequently ABN AMRO Bank is in the process of developing a model which analyses those factors which are crucial to the survival of an airline. These so called critical success factors appeared to be: financial strength, cost structure, domestic market, size of operations, internationalisation and political support. When we applied these factors to the European airline industry, we found that only a limited number of airlines stand a fair chance of surviving the anticipated restructuring process as an independent carrier. Several carriers will either have to merge with stronger partners or they face bankruptcy. Based on the critical success factors, the larger northern carriers enjoy the strongest positions. From amongst the southern airlines, those with a large domestic market and strong political support have a chance to survive, provided they will be able to adjust their cost structure in time.

Author

Airline Operations; Civil Aviation; Air Transportation; Economic Analysis; Operating Costs

19980010795 Nebraska Univ., Aviation Inst., Omaha, NE USA

The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society, Volume 2

Bowen, Brent D., Nebraska Univ., USA; Oum, Tae Hoon, British Columbia Univ., Canada; Sep. 1997; 202p; In English; 1997 Air Transport Research Group of the WCTR Society, 25-27 Jun. 1997, Vancouver, British Columbia, Canada; Sponsored by British Columbia Univ., Canada; Also announced as 19980010796 through 19980010805

Report No.(s): NASA/CR-97-206486; UNOAI-97-5; NAS 1.26:206486; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Topics considered in the proceedings include: (1) Airport policy, management and operations; (2) airport and air navigation policy, management and operations; and (3) airport performance.

CASI

Air Transportation; Airports; Conferences; Industrial Management; Airline Operations

19980010796 National Univ. of Singapore, Dept. of Economics and Statistics, Singapore

Open Skies between East Asia and the US: Implications on Airport Development and Strategy

Chin, Anthony T. H., National Univ. of Singapore, Singapore; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 18p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Topics discussed in the conference paper include deregulation and liberalization in the Asia Pacific; budgetary constraints and reservations on "Big Bang Liberalization"; Open-skies and infrastructure development strategy for the Asia Pacific; international cooperation; and privatization and packaging of airport infrastructure development.

Derived from text

Airports; Airline Operations; Regulations; Civil Aviation; Strategy

19980010797 Osaka Univ., Ibaraki, Japan

How Did We Decide to Keep the Osaka International Airport?

Yasuo, Sakakibara, Osaka Univ., Japan; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 16p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The report discusses the changes in the trilateral relations of airports, airlines and the government in Japan and their effects on airline operations, costs and the consumer.

CASI

Airline Operations; Airports; Civil Aviation; Government/Industry Relations

19980010798 Monash Univ., Dept. of Economics, Clayton, Australia

Price Regulation of Airports in Australia

Forsyth, Peter, Monash Univ., Australia; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the

WCTR Society; Sep. 1997; Volume 2, No. 1; 20p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Federal government is privatising the airports it owns through the Federal Airports Corporation. This corporation owns all the capital city airports, along with a range of airports, large and small in other centres. By May 1997, Melbourne, Brisbane and Perth airports had been privatised, through the sale of very long term leases. Other airports are due to be privatised later. Each of these airports has considerable local monopoly power, and formal price regulation, of the price-cap or CPI-X form, will be applied to them. Like other industries, airports have several distinctive features which pose problems for the design of price regulatory structures. These are considered in this paper. It begins With a brief empirical background on airports in Australia, and then it outlines the issues that can pose problems for price regulation. These include congestion, noise externalities, quality of service, and the choice of the initial level of prices. The nature of each of these problems is considered, and possible solutions to them are analysed. One conclusion is that pure price-caps are likely to be inferior to alternative regulatory structures which take the regulated firm's costs into account when setting the allowable prices.

Author

Airports; Operating Costs; Airline Operations; Economic Analysis

19980010799 Amsterdam Univ., Netherlands

Substitution and Complementarity in Aviation: Airports vs. Airlines

Pels, Eric, Amsterdam Univ., Netherlands; Nijkamp, Peter, Amsterdam Univ., Netherlands; Rietveld, Piet, Amsterdam Univ., Netherlands; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 26p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

In this paper a model concerning substitution and complementarity on the linkage between airport facilities and airlines from the viewpoint of pricing policy is formulated. This model is used to analyze whether airport pricing policies, e.g. to ensure cost recovery, are compatible with competition for transfer passengers. It is found that airports with a high volume of demand can pursue cost recovery and still be the most preferred hub. Airports with a low level of demand will not be the preferred hub, if the larger airport fixes its price at marginal costs.

Author

Airline Operations; Airports; Civil Aviation; Mathematical Models; Economic Analysis; Cost Analysis

19980010800 Calgary Univ., Dept. of Transportation Engineering, Alberta Canada

New Aircraft Characteristics Related to Airport Planning

deBarros, Alexandre Gomes, Calgary Univ., Canada; Wirasinghe, Sumedha Chandana, Calgary Univ., Canada; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 15p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The compatibility of aircraft and airport facilities is of critical importance to the process of planning and design of airports. This becomes particularly true when manufacturers are carrying studies on the development of new aircraft which might have a heavy impact on airport operations. Examples of these new developments are the New Large Aircraft (NLA) for up to 800 passengers, and the new generation of supersonic aircraft for 250 passengers. This paper reviews the main issues regarding compatibility of airport and aircraft and discusses some implications of the introduction of new aircraft.

Author

Airport Planning; Compatibility; Commercial Aircraft; Passenger Aircraft; Civil Aviation

19980010801 Lincoln Coll., Dept. of Resource Management, Canterbury, New Zealand

Air Navigation: The New Zealand Experience

Kissling, Christopher C., Lincoln Coll., New Zealand; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 9p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Air navigation systems have historically been seen as a function of governments as part of their jurisdiction of sovereign air space and because of their responsibility as custodians of safety regulations (Proulx, 1994). The International Civil Aviation Organisation (ICAO) was set in place as the need for internationally agreed standards and procedures for air transport became more important given the post WWII growth in air travel markets. For safety reasons, there is need to have accepted procedures and rules for communications between pilots and air traffic controllers. For this, a common language is a necessity until such time as non voice communications can displace the spoken commands needed to maintain separation of aircraft. There is also the need for universal standards for instrumentation and navigation aids, both on the ground and in the aircraft. It would be most inefficient if different countries all had their own unique communication systems. It would require aircraft manufacturers to install all systems

in their aircraft to enable planes to travel globally as is now commonplace. Control of sovereign airspace has been a closely guarded asset by most countries. It is not automatic for all countries to grant the first freedom of the air (right to overfly territory) to all comers. Security concerns have seen large areas denied to international commercial aviation mainly for military reasons. These areas can cause considerable additional costs to airlines who must eschew shortest great circle routes for more indirect routes to avoid the no-fly zones. As a consequence, most land areas are controlled air space, but there are large expanses of ocean outside territorial jurisdiction that were uncontrolled until ICAO accepted responsibility to apportion responsibility to states who had the ability to initiate air traffic control and flight information services.

Author

Air Navigation; Air Transportation; Airspace; Flight Paths; Air Traffic; Airline Operations

19980010802 New South Wales Univ., Dept. of Transport Engineering, Sydney, Australia

Airport Performance and Communication Strategies for Stakeholder Involvement

Black, J. A., New South Wales Univ., Australia; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 20p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This paper provides a perspective on the performance of airport management in terms of their communication strategies and ways of involving the community when there are airport expansion programs underway. Research into communications strategy and stakeholder involvement is being undertaken for the Australian Federal Airports Corporation Sydney (Kingsford Smith) Airport. The background problems that lead to this study of Australian and other major international airports are explained and the current policy context for public participation in Australia is outlined. The main contribution of this paper is to describe benchmarking as a continuous analytical process for understanding the practices of airport management and to present a theoretical framework for interpreting the results of airport case study approaches to communication and public involvement. Preliminary results are given for the nine busiest Californian airports in terms of passenger traffic.

Author

Airports; Airline Operations; Performance; Airport Planning; Industrial Management

19980010803 Korea Transport Inst., Seoul, Korea, Republic of

A Methodology to Establish the Operational Standards at Airport Passenger Terminal

Park, Yonghwa, Korea Transport Inst., Korea, Republic of; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 21p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A methodology to establish the operation standards of service performance of airport passenger terminals using a perception-response model is discussed here. The proposed approach is defined by the graphical representation of passengers collective attitudes towards the range of operational service at an airport passenger terminal. It adopts new concepts to establish service standards through a special survey to better interpret terminal operations and service level at each facility. It is expressed in terms of passengers' perception of various service levels and their response to the respective service conditions. The methodology may provide practical service standards of airport terminal and prove to be a practical and convenient technique to airport planners, designers, consultants, operators, and airport managers.

Author

Airports; Airline Operations; Models; Standards; Air Transportation; Services

19980010804 California Univ., Berkeley, CA USA

Developing Measures of Airport Productivity and Performance: An Application of Data Envelope Analysis

Gillen, David, California Univ., USA; Lall, Ashish, Nanyang Univ., Singapore; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 21p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Since deregulation the measurement of productivity, performance and profitability of the air transport industry has attracted significant attention. Many studies have been undertaken on the financial and economic productivity of air transport systems, but few have concentrated on the productivity of airports, and how changes in the industry may have affected them. Airports have been quite traditional in their approach to assess their performance. Most measure it in strictly accounting terms by looking at only their total cost and revenue levels and at the resulting surpluses or deficits. A broader method of measuring the efficiency and productivity in both financial and physical terms is therefore needed. In this paper, a new approach to assessing the performance or productivity of airports is developed and estimated. Data envelope analysis is used to construct performance indices on the basis of the multiple outputs which airports produce and the multiple inputs which they utilize. In particular, we develop measures for

terminals and airside operations. The performance measures are then used in a second stage to bit recognition in which environmental, structural and managerial variables are included. The regression results provide a "net" performance index and also identify which variables the managers have some control over and what the relative importance of each variable is in affecting performance. The data set contains a panel of 21 U.S. airports over a five year period.

Author

Airports; Economics; Productivity; Airline Operations; Cost Analysis

19980010805 UCI Brazil, Rio de Janeiro, Brazil

Airport Performance Measurement: Review of Methods and Studies for Measuring Economic Efficiency and Productivity from the Policy Maker's Perspective

Lemaitre, Anne, UCI Brazil, Brazil; The Conference Proceedings of the 1997 Air Transport Research Group (ATRG) of the WCTR Society; Sep. 1997; Volume 2, No. 1; 26p; In English; Also announced as 19980010795; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The measurement and comparison of airport economic efficiency is problematic. These difficulties in comparing airports are mainly due to differences in activities performed at airports, in service standards, and in the regulation of externalities. For the measurement and comparison of airport productivity a number of techniques have been used in the literature. These are the calculation of total factor productivity indexes, data envelopment analysis, the calculation of partial productivity indicators and cost functions. These techniques have been applied to airports by four main groups of researchers; the Institut du Transport Aerien Paris, the University of Berkeley/ U.BC, Cranfield University and the Australian Government. A major conclusion of these studies is the existence of economies of scale and economies of scope for airports. However, for a more comprehensive understanding of differences in airport efficiency, indicators of productivity should be supplemented with indicators of quality e.g., customer satisfaction, level of service provided, operational performance.

Author

Airports; Productivity; Performance; Efficiency; Economic Analysis; Airline Operations

19980010998 Royal Aeronautical Society, London, UK

Recording Aircraft Accident Data: Proceedings

Recording Aircraft Accident Data Proceedings; 1997; 103p; In English; Recording Aircraft Accident Data, 20-21 Oct. 1997, London, UK; Also announced as 19980010999 through 19980011007; ISBN 1-85768-0049; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Topics considered include: Flight Recorders-ICAO to JAR OPS; Evolution of Flight Recorder Media and Protection Techniques; Combined CVR and FDR; The Deployable Solution-Past, Present and Future; Airborne CCTV Applications and ADVR; Recovering Data from Non-Volatile Memories; Analysing Accident Data-Are; Development of New Standards and Recommended Practices; Requirement Development-EUROCAE Working Group 50; Fire and Crash Protection; Data Analysis with Advanced Graphics; and Managing the Systems.

Derived from text

Aircraft Accidents; Flight Recorders; Fire Prevention; Crashes

19980011003 Department of Transport, Air Accident Investigation Branch, Farnborough, UK

Analysing Accident Data - Are the Systems Meeting the Need?

Sheppard, Peter F., Department of Transport, UK; Recording Aircraft Accident Data Proceedings; 1997, pp. 7.1-7.5; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

This paper attempts to go through the stages of extracting, converting, and analysing the information from the accident protected recorders, after an accident has occurred. It tries to point where the problems have been, and why some recorders have not functioned as expected. Losses have occurred due the recorder not surviving an accident or by reason of it having failed before the event. A few suggestions are made as to what might be needed in the future, such as video recording or a sudden event detector.

Author

Aircraft Accident Investigation; Data Processing; Error Analysis

19980011004 Bureau of Air Safety Investigation, Canberra, Australia

Development of New Standards and Recommended Practices

Mayes, Paul, Bureau of Air Safety Investigation, Australia; Recording Aircraft Accident Data Proceedings; 1997, pp. 9.1-10.7; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton

Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The International Civil Aviation Organisation's (ICAO) Standards and Recommended Practices for flight recording and the carriage of flight recorders are contained in Annex 6 and Annex 13. Annex 13 specifically deals with accident investigation and in 1992 ICAO held a major divisional meeting in Montreal to discuss numerous issues dealing with accident investigation. The meeting raised many technical issues relating to flight recording which could not be addressed at the divisional meeting. The meeting therefore agreed to the formation of a panel of experts to deal with the flight recording matters which had been raised and to conduct a full review of the ICAO Standards and Recommended Practices. The panel (FLIRECP) of 34 participants from 17 States and Organisations met in March 1995 for ten days. The panel began by reviewing the current ICAO regulations and comparing them with the current national regulations. Since the last update of the flight recorder Annexes, there had been several important technological advances in aircraft design and systems, and in flight recording technology, and the panel reviewed the impact of these advances. Specific issues which were considered in detail included video recording and data link communications associated with CNS/ATM (FANS). The panel developed thirty recommendations for changes to Standards and Recommended Practices (SARPs) which were submitted to the Air Navigation Commission. The ICAO States were invited to comment on the amendments in 1996 and the modified SARPS will be approved for application in 1998.

Author

Standards; Regulations; Procedures; Flight Recorders; Accident Investigation

19980011005 Penny and Giles Aerospace Ltd., Christchurch, UK

Fire and Crash Protection

Barr, David, Penny and Giles Aerospace Ltd., UK; Recording Aircraft Accident Data Proceedings; 1997, pp. 11.1-11.7; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The objective of this paper is to give the reader who is not familiar with the subject a general insight into how vital cockpit voice and flight data information is protected from the effects of aircraft crashes. It discusses the requirements imposed by regulations for protection of cockpit voice and flight data recorders, the techniques employed to protect the recording medium from the effects of fire and crashes, and the methods used to demonstrate compliance with the regulations. The paper describes the techniques used in general terms only, because the details of the methods that companies use to protect their recorders vary, and the designs are often proprietary to the company and regarded as confidential.

Author

Aircraft Accidents; Flight Recorders; Fire Prevention; Data Recorders

19980011007 British Airways, Heathrow Airport, Middlesex, UK

Managing the Systems

Smith, Robert, British Airways, UK; Recording Aircraft Accident Data Proceedings; 1997, pp. 14.1-14.9; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

With this paper I hope to provide readers with an insight into some of the problems encountered in managing the flight data recorder systems installed across an airline fleet. An outline of the installed system types on the British Airways fleets is given. This combined with an overview of ongoing regulation changes may help in understanding some of the complexities of managing flight data and cockpit voice recording system upgrades, and the corresponding changes to the data recovery systems used to transcribe recorders. Maintenance techniques for flight data recorder systems can be difficult to define and implement in a cost effective manner. After a recent accident involving a DC8 cargo aircraft it was found that only three of eleven parameters were working. This is not the first time that mandatory parameters have been found inoperative after an accident. It has even been the case that a new aircraft has been delivered with parameters inoperative. A well thought out maintenance policy is required if the operator is to minimise aircraft downtime whilst satisfying itself that all parameters are being recorded correctly. Control of flight recorder data after any reportable incident is an area where an operator needs to ensure that adequate procedures exist in order to ensure that things happen rapidly and to known procedures. There are areas in which the design and support of FDR and CVR systems could be improved in the future, and suggestions are made at the end of the paper.

Author

Data Recording; Data Management; Flight Recorders; Cockpits

19980011519 Advisory Group for Aerospace Research and Development, Fluid Dynamics Panel, Neuilly-Sur-Seine, France

Ice Accretion Simulation *La Simulation de l'Accumulation de Glace*

Dec. 1997; 184p; In English

Report No.(s): AGARD-AR-344; ISBN 92-836-1067-9; Copyright Waived; Avail: CASI; A09, Hardcopy; A02, Microfiche

Ice Accretion Simulation is an important issue for flight safety. Every year several incidents happen which can be associated with severe icing problems. Although the bulk of them may be due to human mistakes during flight in icing conditions, some cases remain which are consequences of icing conditions never observed before or of failures not foreseen. Therefore, icing has always attracted great interest from aircraft manufacturers, authorities responsible for certification, and many researchers. The overall goal of the work presented in this report is to improve reliability, to reduce efforts and costs in civil and military aircraft certification/qualification procedures, and to improve civil and military aircraft flight safety. This report covers the effects of ice accretion on wings, tail surfaces, engine inlets, and rotary wings. Experimentally, besides the capability of icing wind tunnel facilities, the problems of spray tanker aircraft experiments are considered, the related similarity laws are examined, and the techniques for measuring droplet size and distribution are reviewed. The basic factors influencing computational predictions are discussed in detail, especially factors such as surface roughness and surface heat transfer. In addition to the 2D prediction methodology, the status of extensions to 3D is presented. An essential aim of a planned follow-on activity should be to establish some well-documented reference cases by suitable in-flight experiments, and to calibrate prediction tools and experimental facilities and techniques for those reference cases.

Author

Ice Formation; Simulation; Flight Safety; Reliability; Costs; Civil Aviation; Prediction Analysis Techniques; Attack Aircraft

19980011540 European Organization for the Safety of Air Navigation, Experimental Centre, Bretigny-sur-Orge, France
Space System Safety Case. Supporting Information, Volume 3

Cottam, M. P., European Organization for the Safety of Air Navigation, France; Jun. 1997; 66p; In English

Report No.(s): PB98-114853; EEC-312-Vol-3; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Volume III of this report forms the third deliverable of the Impact Study on the introduction of a Space System Safety Case into the Safety Regulation of radio navigation services. This volume presents supporting material addressing background aspects to the application of the Safety Case methodology, its history, its status world-wide, lessons learned from previous experience, a collection of relevant references, etc.

NTIS

Radio Navigation; Satellite Navigation Systems; Civil Aviation; Safety Management; Safety Factors

19980011610 Federal Aviation Administration, Washington, DC USA

Notices to Airmen: Domestic/International

May 22, 1997; 236p; In English

Report No.(s): PB97-173116; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

Contents include the following: Airport Data; Airport Operating Restrictions; Runway Data: (Hard Surface Only); Runway Edge Light Systems; Navigational Facilities; Airport Traffic Control Towers; Flight Service Stations; and Weather.

NTIS

Air Navigation; Runways; Airports; National Airspace System

19980011686 Texas Univ., Center for Transportation Research, Austin, TX USA

Evaluating the Feasibility of Reliever and Floating Hub Concepts When a Primary Airline Hub Experiences Excessive Delays Topical Report

Meyer, E., Texas Univ., USA; Rice, C., Texas Univ., USA; Jaillet, P., Texas Univ., USA; McNerney, M., Texas Univ., USA; Sep. 1997; 136p; In English; Sponsored in part by Southwest Region Univ., Transportation Center, College Station, TX.

Report No.(s): PB98-110745; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

This study intends to evaluate strategies to reassign and optimize airport and airline schedules when experiencing a disruptive disturbance at a major hub airport and still maintain a reasonable service. One such option is to temporarily use a nearby airport to act as a connecting hub, which can help reduce delays caused by a major hub's closure. This airport would be known as a reliever or alternate hub. Another option would be over-flying of the hub and swapping larger aircraft onto other routings throughout the system enabling passengers to connect through alternative hubs. Such a scheme is referred to as a 'floating hub' concept. A network-flow approach is used for the schedule allocation and to quantify the costs of the various operating strategies. Operating decisions such as flight cancellation and aircraft rotation options are optimized using a Generic Algorithm approach. Costs for

potential weather delays, additional fuel consumption, infrastructure investment and passenger-delay costs are then compared for all scenarios to evaluate the feasibility of the proposed strategies.

NTIS

National Aviation System; Airports; Hubs; Airline Operations; Alternatives; Evaluation; Feasibility Analysis

19980011982 Ecole Nationale de l'Aviation Civile, Dept. MI, Toulouse, France

Experimentation Results on the ENAC Traffic Simulator, 1994-1996

Bosc, J. F., Ecole Nationale de l'Aviation Civile, France; Jul. 1997; 70p; In Mixed; In French

Report No.(s): PB98-114820; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The Team developed a realistic traffic simulator in order to test various algorithms developed by the Team, that deal mainly with AFTM and medium- or short-term conflict resolution. This simulator has been used to study the influence of various parameters on traffic conditions (number of conflicts and clusters), and to evaluate the performance of some automated conflicts resolution methods. The results of these experiments are presented. Some differences with mathematical models have been observed, and some explanations have been proposed.

NTIS

Air Traffic Controllers (Personnel); Simulators; Collision Avoidance; Experimentation

04

AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control. For related information see also 17 Space Communications, Spacecraft Communications, Command and Tracking and 32 Communications and Radar.

19980010263 Tartu Aviation Coll., Tartu, Estonia

Initial Air Traffic Control Training at Tartu Aviation College

Kulbas, Tanel, Editor, Tartu Aviation Coll., Estonia; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 47-54; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A02, Hardcopy; A02, Microfiche

A well developed air traffic control training system is vitally important for guaranteeing flight safety and the efficient provision of air traffic control services. This article provides an overview of the development of an initial air traffic control training program at Tartu Aviation College. Lessons learned from the first two classes of students provide the basis for future improvements in the training program.

Author

Air Traffic Control; Education; Flight Safety

19980010827 Naval Research Lab., Washington, DC USA

Quantic Global Positioning System Timing Receiver Live Static Test

Powers, Edward D., Naval Research Lab., USA; Jone, Edward C., Naval Research Lab., USA; Brad, Jimmie, Naval Research Lab., USA; Dec. 02, 1997; 31p; In English

Report No.(s): AD-A332332; NRL/MR/8150--97-8117; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The GPS Program Offices, Los Angeles Air Force Base, California, has established a Center of Expertise (COE) comprised of several agencies, each providing unique GPS test capabilities for the purpose of developing a Commercial Receiver Test Program (CRTP). The Responsible Test Organization (RTO) for the COE is the 746th Test Group, 46th Guidance Test Squadron, Holloman Air Force Base, New Mexico. The Naval Research Laboratory (NRL) has been designed as a COE with the responsibility of testing the time output characteristics and accuracy of the commercial receivers. The NRL clock testing facility has time traceable to the U.S. Naval Observatory and the procedure used are taken from the CORE INS/GR/EGI TEST PLAN prepared by RTO.

DTIC

Global Positioning System; Static Tests; Radio Receivers

19980010830 Army Test and Evaluation Command, Aberdeen Proving Ground, MD USA

Test Operations Procedure (TOP) 3-2-046, Land Navigation and Positioning Systems Final Report

Jul. 31, 1997; 45p; In English

Report No.(s): AD-A332563; TOP-3-2-046; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Test Operation Procedure (TOP) describes procedures for conducting technical performance tests of land navigation and positioning systems. It is modeled around the Modular Azimuth Positioning System Hybrid (MAPS Hybrid) but is applicable to all land based navigation systems including those using the Global Position System (GPS). This TOP incorporates procedures that require automated data collection instrumentation and a reference system that will provide medium to high position/attitude accuracy.

DTIC

Global Positioning System; Performance Tests; Position Errors; Positioning; Attitude (Inclination)

19980010925 Federal Aviation Administration, Technical Center, Atlantic City, NJ USA

Mode S Beacon System Enroute Configuration Interim Beacon Initiative (IBI) Mode Operational Test and Evaluation (OT&E) Test Report

Starkman, Joseph J., Federal Aviation Administration, USA; Karitis, Paul, Federal Aviation Administration, USA; Sep. 1997; 82p; In English

Report No.(s): AD-A331655; DOT/FAA/CT-TN95/61; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document reports the findings of the operational evaluation tests conducted on the Interim Beacon Initiative (IBI) mode, enroute configuration of the Mode Select Beacon System (Mode S). The tests were conducted at the Parker radar facility in Denver, Colorado, site of the first enroute Mode S system delivery. The Mode S system under test was a fully configured, dual-channel sensor having all required external interfaces connected to actual National Airspace System (NAS) equipment. A combination of system optimization, surveillance performance evaluation, and operational suitability testing were performed as part of this Operational Test and Evaluation (OT&S) effort. Test goals were to ensure proper operation of the Mode S sensor in IBI mode for an enroute configuration, while integrated with appropriate NAS equipment. The tests were conducted in accordance with procedures for OT&E stated in FAA Order 1810.4B. The format of this test report is in accordance with FAA-STD-024b.

DTIC

Search Radar; Radar Beacons; Evaluation; Performance Tests; Air Traffic Control

19980012000 Naval Postgraduate School, Monterey, CA USA

Asynchronous Data Fusion for AUV Navigation Using Extended Kalman Filtering

Thorne, Richard L., Naval Postgraduate School, USA; Mar. 1997; 166p; In English

Report No.(s): AD-A331863; NPS-ME-97-003; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A truly Autonomous Vehicle must be able to determine its global position in the absence of external transmitting devices. This requires the optimal integration of all available organic vehicle attitude and velocity sensors. This thesis investigates the extended Kalman filtering method to merge asynchronous heading, heading rate, velocity, and DGPS information to produce a single state vector. Different complexities of Kalman filters, with biases and currents, are investigated with data from Florida Atlantic's Ocean Explorer 2 surface run. This thesis used a simulated loss of DGPS data to represent the vehicle's submergence. All levels of complexity of the Kalman filters are shown to be much more accurate than the basic dead reckoning solution commonly used aboard autonomous underwater vehicles.

DTIC

Multisensor Fusion; Kalman Filters; Underwater Vehicles

05

AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology. For related information see also 18 Spacecraft Design, Testing and Performance and 39 Structural Mechanics. For land transportation vehicles see 85 Urban Technology and Transportation.

19980009628 Air Command and Staff Coll., Maxwell AFB, AL USA

Strikestar 2025 Topical Report

Carmichael, Bruce W., Air Command and Staff Coll., USA; Devne, Troy E., Air Command and Staff Coll., USA; Kaufman, Robert J., Air Command and Staff Coll., USA; Pence, Patrick E., Air Command and Staff Coll., USA; Wilcox, Richard S., Air Command and Staff Coll., USA; Aug. 1996; 90p; In English

Report No.(s): AD-A332349; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

We examined unmanned aerial vehicles (UAV), knowing that similar research had produced naysayers and even some active hostility. However, we are genuinely concerned for future modernization efforts as budgets and manpower decrease. We came to an early conclusion that manned vehicles provide a flexibility and level of accountability far beyond that of unmanned vehicles.

But considering our changing world, the use of unmanned vehicles for missions beyond reconnaissance is both technically feasible and cost-attractive. We envision the UAV proposed here to be a force multiplier for the air and space warrior - a new tool in the warrior's arsenal.

DTIC

Unmanned Spacecraft; Pilotless Aircraft; Military Technology

19980009825 SRI International Corp., Menlo Park, CA USA

Advanced Armor Technology: Application Potential for Engine Fragment Barriers for Commercial Aircraft Final Report

Shockey, D. A., SRI International Corp., USA; Giovanola, J. H., SRI International Corp., USA; Simons, J. W., SRI International Corp., USA; Erich, D. C., SRI International Corp., USA; Klopp, R. W., SRI International Corp., USA; Sep. 1997; 78p; In English; Original contains color illustrations

Report No.(s): PB98-108418; SRI-PYU-7412; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

On rare occasions, aircraft turbine engines fail catastrophically and send into the aircraft fragments that disrupt control, fuel, and propulsion systems and jeopardized the ability of the aircraft to land safely. To enhance the survivability of commercial aircraft in the event of an uncontained turbine engine failure, the Federal Aviation Administration (FAA) is sponsoring a research program aimed at protecting components of the aircraft that are critical to continued safe flight and landing. As a member of the FAA contractor team, SRI International is attempting to identify technology transfer opportunities for aircraft engine fragment barriers by surveying the recent advances in Department of Defense (DOD) armor structures. This report reviews the current state of military armor technology and identifies concepts, materials, and designs that may be useful in developing engine fragment barriers with low added weight and cost. Based on the findings, fragment barrier designs are postulated. Their feasibility has begun to be evaluated by performing fragment impact calculations and experiments. This work has confirmed high-strength polymer fibers as the advanced material most appropriate for protecting aircraft from engine fragments and has identified three particular polymers (fibers of aramids, polyethylenes, and polybenzodazole) as having the prerequisite of low density and high strength. Furthermore, these materials appear to have sufficient flame resistance, water absorption resistance, and thermal and acoustic insulation properties to serve as building blocks for barriers. The next step is to design practical barriers from these fibers.

NTIS

Commercial Aircraft; Aircraft Engines; Aircraft Safety; Gas Turbine Engines; Technology Transfer; Aramid Fibers; Polyethylenes

19980010024 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Cost Per Flying Hour Analysis of the C-141

Omlor, Christopher J., Air Force Inst. of Tech., USA; Sep. 1997; 82p; In English

Report No.(s): AD-A329936; AFIT/GTM/LAL/97S-7; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This paper sought to examine if DoD's current transfer pricing method places AMC in a price competitive position with the government commercial rates and promotes managers to make the best decisions. Attention was paid to the stated customer concerns that current transfer pricing methods incorporate overhead and sunk costs that are not attributable to routine movement of peacetime cargo and could make AMC non price competitive with commercial vendors. The findings are that AMC currently uses full cost transfer pricing, as required by DoD policy, that includes significant overhead and sunk costs associated with its wartime responsibilities. The full cost method of transfer pricing is not in congruence with the generally accepted accounting practices and the private sector position that, with excess capacity and no outside market, a unit should transfer price at variable cost. The current cost per flying hour is inflated by fixed costs, primarily overhead and sunk cost, by 60.47 percent. This means the CPFH is 2.5 times greater than the cost that AMO incurs for operating a peacetime mission.

DTIC

C-141 Aircraft; Congruences; Cargo; Costs

19980010422 NASA Washington, Washington, DC USA

X-33 Development History Progress Report No. 4

Butrica, Andrew J., NASA Washington, USA; Dec. 15, 1997; 7p; In English

Contract(s)/Grant(s): NASw-97005

Report No.(s): NASA/CR-97-206438; NAS 1.26:206438; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The problem of dealing with various types of proprietary documents, whether from the Lockheed Martin, the Skunk Works, McDonnell Douglas, Rockwell, and other corporations extant or extinct, remains unresolved. The computerized archive finding

aid has over 100 records at present. These records consist of X-33 photographs, press releases, media clippings, and the small number of X-33 project records collected to date.

Author

Computer Storage Devices; Computer Systems Programs; Data Processing

19980010900 Naval Postgraduate School, Monterey, CA USA

Development of a Dynamic Model for a UAV

Papageorgiou, Evangelos C., Naval Postgraduate School, USA; Mar. 1997; 116p; In English

Report No.(s): AD-A331969; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Moments of inertia were experimentally determined and the longitudinal and lateral/directional static and dynamic stability and control derivatives were estimated for a fixed wing Unmanned Air Vehicle (UAV). High fidelity, non-linear equations of motion were derived and tailored for use on the specific aircraft. Computer modeling of these resulting equations was employed both in Matlab/Simulink and in Matrix(sub x)/Systembuild. The resulting computer model was linearized at a specific flight condition, and the dynamics of the aircraft were predicted. Several flight tests were conducted at a nearby airfield and the behavior of the aircraft was compared to that of the computer model. The longitudinal dynamics as depicted by the short period mode were found to be almost identical with those predicted by the non-linear computer model. The phugoid mode was also observed and found to be in close agreement. In the lateral/directional dynamics, flight test was employed to improve the model and the parameters were modified to obtain a better math. Ultimately a reasonably accurate non-linear model was achieved as required for purposes of control and navigation system design.

DTIC

Moments of Inertia; Mathematical Models; Static Stability; Dynamic Stability; Flight Tests; Pilotless Aircraft; Directional Stability

19980010907 Washington Univ., Dept.of Mechanical Engineering, Saint Louis, MO USA

Multidisciplinary Rotorcraft Analysis and Simulation, 1 Sep. 1994 - 31 Aug. 1997

Peters, David A., Washington Univ., USA; Nov. 03, 1997; 7p; In English

Contract(s)/Grant(s): DAAH04-94-G-0351

Report No.(s): AD-A332119; ARO-33853.12-EG-DPS; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This three-year grant is now completed, although an augmentation grant is still continuing the work along new lines. In this grant, we developed the analysis and simulation tools necessary to treat rotorcraft design problems when the rotorcraft has unsteady or unknown RPM. The tools developed include a Fast Floquet theory that can be applied to rotorcraft with multiple rotors and unknown RPM, a new spatially based Fourier Series Method, several types of auto pilots and discrete auto pilots, and hybrid combinations of methods. The work also developed a mathematical theory of trim that includes unsteady and unknown RPM in the development as well as numerical and experimental test beds on which to test new methods.

DTIC

Rotary Wing Aircraft; Design Analysis; Computerized Simulation; Rotary Wings

19980010947 Pennsylvania State Univ., University Park, PA USA

Vibration, Stability, and Transient Response of Helicopters with Elastically Tailored Composite Rotor Blades Final Report, Jun. 1994 - 31 May 1997

Smith, Edward C., Pennsylvania State Univ., USA; Sep. 29, 1997; 5p; In English

Contract(s)/Grant(s): DAAH04-94-C-0206

Report No.(s): AD-A331972; ARO-32145.4-EG-YIP; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Aeroelastically tailored composite rotor blades offer significant potential for improved stability, reduced vibration, simplified hub design, and improved handling qualities of rotorcraft. Development of new analytical tools to predict the complex dynamic behavior of these rotor systems is essential to the integration of tailored blade technology into next generation rotorcraft systems. The focus of the present work has been: (1) Advancements in analysis methods for open section composite beams, subject to warping restraint effects, (2) Advancement in cross-sectional modeling of thick-walled composite blade sections, (3) Development and application of an aeroelastic analysis for investigation of composite elastic tailoring for stall alleviation and vibration reduction.

DTIC

Stability; Transient Response; Dynamic Characteristics; Vibration Damping; Rotary Wings

19980010971 Army Command and General Staff Coll., Fort Leavenworth, KS USA

Is There a Role for Modern Day Seaplanes in Open Ocean Search and Rescue?

Brown, David R., Army Command and General Staff Coll., USA; Jun. 07, 1997; 86p; In English

Report No.(s): AD-A331533; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis reviews the use of the amphibious airplane in open ocean search and rescue, and examines the applicability of a seaplane to future ocean rescue operations. The author examines the history of amphibious aircraft and why they are no longer in use by the U.S. military, including the Coast Guard. Then a comprehensive review of open ocean search and rescue missions conducted by the U.S. Coast Guard between 1993 and 1995 is used to analyze and predict whether the use of seaplanes by U.S. search and rescue agencies would save additional lives over the current methods in the open ocean environment.

DTIC

Seaplanes; Rescue Operations; Amphibious Aircraft

19980011657 Naval Postgraduate School, Monterey, CA USA

Analysis of Potential Structural Design modifications for the Tail Section of the RAH-66 Comanche Helicopter

Tobin, Vincent M., Naval Postgraduate School, USA; Jun. 1997; 117p; In English

Report No.(s): AD-A331748; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Army RAH-66 Comanche Helicopter made its first flight in January of 1996. Its current structural configuration, however, does not meet the Army's requirements for radar signature. Structural configurations of the tailcone that meet radar cross-section requirements tend to lack sufficient structural stiffness due to the presence of Kevlar in place of graphite on the outer mold line. This thesis investigates potential structural design modifications to the Comanche tailcone that would move the design closer to meeting both its structural and radar signature requirements. Structural geometry modifications with baseline (current configuration) materials increased torsional stiffness by nine percent. Geometry modifications using radar signature-compliant materials reduced torsional stiffness by 10 percent. The geometry changes analyzed produce structural performance improvements insufficient to allow the use of radar-compliant materials without further geometry changes.

DTIC

Structural Analysis; Helicopters; Structural Design; Tail Assemblies

07

AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and onboard auxiliary power plants for aircraft. For related information see also 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels, and 44 Energy Production and Conversion.

19980009416 Illinois Inst. of Tech., Fluid Dynamics Research Center, Chicago, IL USA

Application of Micro Electro-Mechanical Sensors and Activators in the Investigation of Supersonic Jet Screech Final Report, 1 Sep. 1995 - 30 Jul. 1997

Nagib, Hassan, Illinois Inst. of Tech., USA; Papp, Joe, Illinois Inst. of Tech., USA; Naguib, Ahmed, Illinois Inst. of Tech., USA; Jul. 30, 1997; 14p; In English

Contract(s)/Grant(s): F49620-93-I-0459

Report No.(s): AD-A330601; AFOSR-TR-97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An investigation aimed at examining the usability of MEMS based actuators for controlling supersonic jet screech has been conducted. First, documentation of the screech phenomenon in the newly constructed high speed jet facility (HSJF) at IIT has been completed. Results from microphone measurements complemented with earlier shadowgraph and schlieren visualization have shown that the screech characteristics in the HSJF conforms with that published in the literature. Second, detailed investigation of the first generation MEMS actuators showed that the actuators could not operate for speeds higher than 70 m/s while maintaining contact with the jet shear layer. This was attributed to the bending moment acting on the actuator due to flow loading on the overhanging head portion of the device. This observation was confirmed utilizing a special headless actuator design. The outcome of the tests of the first generation devices guided the development of a second generation of actuators. Those actuators, which are also described within this report, are currently being evaluated.

DTIC

Electromechanical Devices; Shadowgraph Photography; Shear Layers; Supersonic Jet Flow; Bending Moments

19980009645 International Trade Administration, Washington, DC USA

Industry and Trade Summary: Aircraft and Reaction Engines, Other Gas Turbines and Parts

Mar. 1994; 29p; In English

Report No.(s): PB97-211692; USITC/PUB-2746; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This summary will discuss key aspects of the global industry that produced aircraft and reaction (rocket) engines, nonaircraft gas turbines, and parts of these engines during 1988-92. The reports is organized into three major sections: U.S. and foreign industry profiles; U.S. and foreign tariffs and nontariff measures; and U.S. performance in domestic and foreign markets. In addition, appendices provide information explaining tariff and trade agreements and highlight trade statistics. The products covered by this summary include aircraft and nonaircraft gas turbines, piston engines designed for aircraft, reaction engines, and parts for all these engines. An aircraft engine, which may be either piston-type or gas-turbine, is used to create forward movement in aircraft. The reaction engines covered here include engines other than turbojets design principally for use in rockets. The nonaircraft gas turbines covered herein are used for stationary power needs, such as the generation of electricity, industrial cogeneration, and mechanical drive applications.

NTIS

Aircraft Engines; Rocket Engines; Turbojet Engines; Piston Engines; Gas Turbines; Mechanical Drives

19980010521 Williams International, Walled Lake, MI USA

General Aviation Propulsion (GAP) Program, Turbine Engine System Element, 2 Dec. 1996 - 30 Sep. 1997

Oct. 06, 1997; 12p; In English

Contract(s)/Grant(s): NCC3-514

Report No.(s): NASA/CR-97-206730; NAS 1.26:206730; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of the General Aviation Propulsion (GAP) Program Turbine Engine System Elements is to conduct a shared resource project to develop an affordable gas turbine engine for use on 4 to 6 place, light aircraft that will lead to revitalization of the general aviation industry in the USA, creating many new, high-quality jobs.

Author

Gas Turbine Engines; Product Development; Propulsion System Performance

19980010882 Virginia Polytechnic Inst. and State Univ., Dept. of Mechanical Engineering, Blacksburg, VA USA

Experimental and Numerical Studies of Unsteady Heat Transfer in a Transonic Turbine Final Report, 1 Jul. 1994 - 30 Jun. 1997

Ng, Wing, Virginia Polytechnic Inst. and State Univ., USA; Sep. 1997; 182p; In English

Contract(s)/Grant(s): F49620-94-I-0367

Report No.(s): AD-A332574; AFOSR-97-0590TR; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The effects of a shock wave passing through a blade passage on surface heat transfer to turbine blades were measured experimentally. The experiments were performed in a transonic linear cascade which matched engine Reynolds number, Mach number, and shock strength. Unsteady heat flux measurements were made with Heat Flux Microsensors on both the pressure and suction surfaces of a single blade passage. Unsteady static pressure measurements were made using Kulite pressure transducers on the blade surface and end walls of the cascade. The experiments were conducted in a stationary linear cascade of blades with heated transonic air flow using a shock tube to introduce shock waves into the cascade. A time-resolved model based on conduction in the gas was found to accurately predict heat transfer due to shock heating measured during experimental tests without flow. The model under-predicted the experimental results with flow, however, by a factor of three. The heat transfer increase resulting from shock passing in heated flow averaged over 200 us (typical blade passing period) was found to be a maximum of 60% on the pressure surface near the leading edge. Based on experimental results at different flow temperatures, it was determined that shock heating has the primary effect on heat transfer, while heat transfer increase due to boundary layer disturbance is small.

DTIC

Shock Waves; Turbine Blades; Transonic Flow; Gas Turbines; Shock Heating; Boundary Layer Stability; Experimentation; Turbulent Heat Transfer

19980010887 Ecole Centrale de Lyon, Ecully, France

Boundary Layer Measurements on the Pressure and Suction Sides of an Inlet Guide Vane Turbine Blade

Bario, F., Ecole Centrale de Lyon, France; Beral, C., Ecole Centrale de Lyon, France; 1996; 12p; In English

Report No.(s): PB96-175179; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Though numerous gas turbines have been used worldwide for over half a century, the flow on the turbine blades is not yet completely understood and consequently difficult to predict. In a first approximation, the heat transfer depends on the boundary

layer state. Its calculation is one of the main objectives of a turbine designer. Precise calculation is needed to achieve high efficiency engines. If it is now possible to compute laminar or turbulent boundary layers with good accuracy (except in particular cases such as strong separation...), transition is always difficult to compute as it is the birth of turbulence. Laser Doppler measurements of shear stress, normal and streamwise mean and fluctuating velocities of the pressure and suction side boundary layers on an inlet guide vane turbine blade have been made for two turbulence levels.

NTIS

Gas Turbines; Turbine Blades; Laminar Boundary Layer; Turbulent Boundary Layer; Shear Stress; Heat Transfer

08

AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots. For related information see also 05 Aircraft Design, Testing and Performance.

19980010110 Duke Univ., Dept. of Mechanical Engineering and Materials Science, Durham, NC USA

Control of Nonlinear Behavior: Experiments Final Report, 10 Jun. 1993 - 9 Sep. 1996

Virgin, L. N., Duke Univ., USA; Dowell, E. H., Duke Univ., USA; Aug. 1997; 7p; In English

Contract(s)/Grant(s): F49620-93-I-0382

Report No.(s): AD-A329707; AFOSR-97-0441TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The full effects of the problem of control surface freeplay in an aeroelastic system are examined in the context of a three degree of freedom aeroelastic typical section. A computationally efficient numerical model of the nonlinear system is presented, in which the control surface freeplay is modeled as a system of piecewise linear state space models. The system response is determined by time marching of the governing equations using a standard Runge Kutta algorithm in conjunction with Henon's method for integrating a system of equations to a prescribed surface of phase space section. An experimental model which closely approximates the three degree of freedom typical section in two-dimensional, incompressible flow has been created to validate the theoretical model. Consideration is also given to modeling realistically the structural damping present in the experimental system. Limit cycle oscillations are studied numerically and experimentally. The numerical model captures the full range of nonlinear behavior present in the physical system, including decaying oscillations, limit cycles, quasiperiodicity, nonperiodicity, possible chaos and divergent flutter.

DTIC

Aeroelasticity; Control Surfaces; Degrees of Freedom; Dynamic Structural Analysis; Incompressible Flow; Mathematical Models; Nonlinear Systems; Structural Vibration; Two Dimensional Flow

19980010835 University of Southern California, Los Angeles, CA USA

ASSERT Supplement: Robust Control Methods Final Report, 1 Sep. 1993 - 31 Aug. 1997

Safonov, Michael G., University of Southern California, USA; Sep. 30, 1997; 7p; In English

Contract(s)/Grant(s): F49620-93-I-0505

Report No.(s): AD-A332156; AFOSR-97-0617TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is the final report for research supported under AASERT Grant F49620-93-I-0505 during the period September 1, 1993 through August 31, 1997. This grant supplemented AFOSR Grant F49620-92-J-0014 by providing support for U.S. citizen graduate research assistants. This report summarizes the research achievements that have been made possible by this additional support during the period September 1, 1993 through August 31, 1997. The goal of the research has been to develop theory and engineering methods to facilitate the design of aerospace control systems with a robust tolerance to modeling uncertainty, including nonlinearity, disturbances and unmodelled dynamical perturbations. During the period of the AASERT grant, research effort was broadly focused on developing the theory of extending class of solvable robust control problems and on developing a theory to accommodate the issues that arise in going from experimental data to robust control designs. Significant progress was achieved in advancing the Bilinear Matrix Inequality (BMI) and the Unfalsified Control formulations of robust control problems. Missile and spacecraft design studies demonstrated the potential of these methods.

DTIC

Control Systems Design; Aerospace Systems

19980010875 Naval Postgraduate School, Monterey, CA USA

Nonlinear Analysis of Coupled Roll/Sway/Yaw Stability Characteristics of Submersible Vehicles

Tsamilis, Sotirios E., Naval Postgraduate School, USA; Mar. 1997; 84p; In English

Report No.(s): AD-A331440; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The problem of coupled roll, sway, and yaw stability analysis of submersible vehicles is analyzed, with particular emphasis on nonlinear studies. Previous results had indicated that a primary loss of stability is through the development of limit cycles. This loss of stability is due to the coupling of roll into sway and yaw and cannot be predicted by considering the uncoupled dynamics. In this study, it is shown that the mechanism of loss of stability is through bifurcations to periodic solutions. These are characterized as either subcritical or supercritical, depending on the sign of a certain nonlinear coefficient. Implications of these results to vehicle performance and operations are discussed.

DTIC

Stability; Stability Tests; Symbols; Underwater Vehicles; Yaw

19980010888 Wright Lab., Air Force Materiel Command, Wright-Patterson AFB, OH USA

Progress and New Techniques in Buffet Alleviation Final Report, Oct. 1994 - Sep. 1997

Calarese, Wladimiro, Wright Lab., USA; Turner, Elijah, Wright Lab., USA; Sep. 1997; 76p; In English

Contract(s)/Grant(s): AF Proj. 2402

Report No.(s): AD-A331987; WL-TM-97-3084; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Research for twin-tail buffet alleviation is centered on ground tests, wind tunnel tests, and computational fluid dynamics (CFD) analysis. The objective of the research is to improve present technology to obtain a significant reduction in vibration due to buffet. One of the techniques for active control of buffet is the use of smart structures with piezoelectric actuators. The actuators are embedded in the vertical tails in the most advantageous locations to reduce the response of the various structural modes of vibration due to buffet excitation. Ground and wind tunnel tests are necessary to ascertain the piezoelectric actuator's authority at full loads. It is also necessary to evaluate the increase in weight compared with the increase in damping. The results using two different types of piezoelectric actuators are encouraging. In-house wind tunnel tests on a 4.7% scale model of an F-15C aircraft were also conducted to ascertain the effects of tangential blowing and piezoelectric actuators. The tests were performed in the SARL (Subsonic Aerodynamics Research Laboratory) wind tunnel. Tangential blowing had some effect at lower angles of attack. A numerical investigation was conducted simultaneously. This report presents an overview of the buffet research at various organizations, results of the in-house wind tunnel test, and a summary of the computational effort.

DTIC

Aerodynamic Stability; Wind Tunnel Tests; Technologies; Ground Tests; Computational Fluid Dynamics; Vibration; Buffeting; Drag Reduction

19980011665 Naval Surface Warfare Center, Dahlgren, VA USA

Terminal Guidance with a Side-Mounted Sensor against a Stationary Target

Groves, G. W., Naval Surface Warfare Center, USA; Khodary, A., Naval Surface Warfare Center, USA; Dec. 1997; 31p; In English

Report No.(s): AD-A332816; NSWCDD/TN-97/190; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Terminal guidance under the constraints that (i) the heading error must be greater than a specified angle (in order that the sensor see the target), and (ii) the magnitude of the lateral acceleration is limited, is studied. Only the kinematic features of flight are considered. It is demonstrated that a planar trajectory is as good as any for the purpose of hitting a stationary target on the ground. In order to hit, or come close to the target, the final segment of terminal flight must violate the heading-error constraint, during which time the target is invisible. If there is an additional condition (iii) that the missile must remain above the target (e.g., for imaging) during terminal descent, the optimum trajectory is a conic spiral. As in the previous case, there is a final segment of blind flight. The miss distance depends on the constraints and other parameters of the problem, as well as on the sensor measurement errors. Monte Carlo simulation was used to estimate the miss distance under various conditions.

DTIC

Terminal Guidance; Trajectories; Trajectory Optimization; Missiles

09

RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tubes; and aircraft engine test stands. For related information see also 14 Ground Support Systems and Facilities (Space).

19980009320 Florida Univ., Gainesville, FL USA

Control of the NASA Langley 16-Foot Transonic Tunnel with the Self-Organizing Feature Map

Motter, Mark A., Florida Univ., USA; 1998; 143p; In English

Report No.(s): NASA/TM-98-206722; NAS 1.15:206722; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A predictive, multiple model control strategy is developed based on an ensemble of local linear models of the nonlinear system dynamics for a transonic wind tunnel. The local linear models are estimated directly from the weights of a Self Organizing Feature Map (SOFM). Local linear modeling of nonlinear autonomous systems with the SOFM is extended to a control framework where the modeled system is nonautonomous, driven by an exogenous input. This extension to a control framework is based on the consideration of a finite number of subregions in the control space. Multiple self organizing feature maps collectively model the global response of the wind tunnel to a finite set of representative prototype controls. These prototype controls partition the control space and incorporate experimental knowledge gained from decades of operation. Each SOFM models the combination of the tunnel with one of the representative controls, over the entire range of operation. The SOFM based linear models are used to predict the tunnel response to a larger family of control sequences which are clustered on the representative prototypes. The control sequence which corresponds to the prediction that best satisfies the requirements on the system output is applied as the external driving signal. Each SOFM provides a codebook representation of the tunnel dynamics corresponding to a prototype control. Different dynamic regimes are organized into topological neighborhoods where the adjacent entries in the codebook represent the minimization of a similarity metric which is the essence of the self organizing feature of the map. Thus, the SOFM is additionally employed to identify the local dynamical regime, and consequently implements a switching scheme that selects the best available model for the applied control. Experimental results of controlling the wind tunnel, with the proposed method, during operational runs where strict research requirements on the control of the Mach number were met, are presented. Comparison to similar runs under the same conditions with the tunnel controlled by either the existing controller or an expert operator indicate the superiority of the method.

Author

Transonic Wind Tunnels; Models; Technologies; Sequential Control

19980009934 NERAC, Inc., Tolland, CT USA

Blowdown Wind Tunnels: Latest Citations from the Aerospace Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862792; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the design, construction, operation, and performance of blowdown wind tunnels. The use of compressed gas, mechanical piston, or combustion exhaust to provide continuous or short-duration operation from transonic to hypersonic approach velocities is discussed. Also covered are invasive and non-invasive aerothermodynamic instrumentation, data acquisition and reduction techniques, and test reports on aerospace components. Comprehensive coverage of wind tunnel force balancing systems and supersonic wind tunnels are covered in separate bibliographies.

NTIS

Bibliographies; Wind Tunnels; Design Analysis; Performance Prediction

19980009938 NERAC, Inc., Tolland, CT USA

Hypersonic Wind Tunnels: Latest Citations from the Aerospace Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862883; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the design, construction, operation, performance, and use of hypersonic wind tunnels. References cover the design of flow nozzles, diffusers, test sections, and ejectors for tunnels driven by compressed air, high-pressure gases, or cryogenic liquids. Methods for flow calibration, boundary layer control, local and freestream turbulence reduction, and force measurement are discussed. Intrusive and non-intrusive instrumentation, sources of measurement error, and measurement corrections are also covered. The citations also include the testing of inlets, nozzles, airfoils, and other components of hypersonic aerospace vehicles. Comprehensive coverage of supersonic and blowdown wind tunnels, and force balance systems for wind tunnels are covered in separate bibliographies.

NTIS

Bibliographies; Wind Tunnels; Hypersonic Wind Tunnels; Design Analysis; Construction; Operations Research; Performance Prediction

19980010230 Naval Surface Warfare Center, Indian Head Div., Indian Head, MD USA

Development of an Electrochemical Waste Treatment Facility

Naufflett, George W., Naval Surface Warfare Center, USA; Farncomb, Robert E., Naval Surface Warfare Center, USA; Second

Aerospace Environmental Technology Conference; Mar. 1997, pp. 429-436; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Electrochemical Oxidation can offer a viable alternative to incineration, landfill, and deep well injection for disposal of harmful chemicals. The U.S. Navy generates about one million pounds of Otto Fuel II waste per year. About two thirds of the waste is liquid and one third of it is solid waste contaminated with the fuel. Otto Fuel II is a three component liquid monopropellant used for torpedo propulsion. The Indian Head Division, Naval Surface Warfare Center has been tasked to conduct a feasibility study utilizing an indirect electrochemical oxidation process for the destruction of Otto Fuel II waste, and provide technical and engineering support for construction of a full scale disposal facility at the Naval Undersea Warfare Center, Keyport, WA. Indirect electrochemical oxidation of organic materials is facilitated by using metal ions in a mineral acid electrolyte as a regenerative catalyst or mediator. Silver, cobalt, nickel, cerium, magnesium, and iron have been used as regenerative oxidants. Catalyzed Electrochemical Oxidation (CFO), a low temperature and low pressure electrochemical oxidation process developed by Battelle Pacific Northwest Laboratories (PNL) is being examined for use in the destruction of Otto Fuel II Waste. The CEO process uses the regenerative oxidant cerium ($\text{Ce}(3+) / \text{Ce}(4+)$) for the treatment of organic waste. Laboratory and bench scale studies showed that Otto Fuel II is readily destroyed by the CEO process. Pilot scale CEO studies are planned to determine the operational requirements for a full scale CEO plant to treat Otto Fuel II waste. A summary of this work will be presented in this paper. The primary focus of the paper centers around the establishment of requirements for a full scale CEO facility.

Author

Electrochemical Oxidation; Waste Treatment; Monopropellants; Waste Disposal; Oxidizers; Metals

19980010614 NERAC, Inc., Tolland, CT USA

Force Balance Systems for Wind Tunnels (Latest Citations from the Aerospace Database)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-862735; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, installation, and use of force balance systems to measure forces on wind tunnels, test models, or related hardware. External and internal balance systems for subsonic, transonic, supersonic, and hypersonic facilities that operate continuously or intermittently are discussed. Calibration, monitoring, and control of force balances, and the acquisition and reduction of force, load, and moment data during testing are covered. Error sources and measurement corrections are also included. The citations also examine the use of sting-mounted sensors to measure force components, and the effects of stings on the force measurements. Blowdown, supersonic, and hypersonic wind tunnel facilities are covered in separate bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Wind Tunnels; Force Distribution

19980010902 Air Command and Staff Coll., Maxwell AFB, AL USA

Automated Civil Engineer Planning and Execution System (ACEPES) Topical Report

Bodner, Bryan J., Air Command and Staff Coll., USA; Bridgewater, Aaron C., Air Command and Staff Coll., USA; Hutchison, Michael W., Air Command and Staff Coll., USA; Myers, Michael K., Air Command and Staff Coll., USA; Scott, Paul L., Air Command and Staff Coll., USA; Scott, Paul L., Air Command and Staff Coll., USA; Apr. 1996; 140p; In English

Report No.(s): AD-A331520; ACSC/DEA/217/96-04; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This research furthers the state of knowledge of automation applications for civil engineering air base planning. Although Air Force Civil Engineers (CE) have historically used new technologies to improve their effectiveness, CE combat support has not yet fully benefited from improvements in automation technology. This study provides facts and recommendations necessary to field automation tools that will enable CE to accomplish beddown planning faster, more accurately, and as an integrated player in C41 battle space operations.

DTIC

Planning; Structural Engineering; Armed Forces

19980011609 Naval Surface Warfare Center, Dahlgren Div., Dahlgren, VA USA

Graphite Heating Element Operating Temperature Measurements in the NSWC Hypervelocity Wind Tunnel 9 Final Report

Metzger, Michael A., Naval Surface Warfare Center, USA; Sep. 1997; 51p; In English

Report No.(s): AD-A329681; NSWCDD/TR-97/174; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents real-time temperature measurements of a graphite heating element operating in the Naval Surface Warfare Center, Dahlgren Division (NSWCDD) Hypervelocity Wind Tunnel No. 9 facility. Tunnel 9 uses a large graphite element to heat nitrogen gas to 3100 F prior to releasing this gas to the test section, where it achieves hypersonic speeds to Mach 16.5. The present effort focused on obtaining the operating temperature of an uncoated heating element with a view to determine if an oxidation-resistant, silicon-carbide coated, graphite element, of the same size now used in the facility, might be used to batch-heat air in the heating vessel. The reported results appear promising in that the measured peak surface temperature of the element could be held to below 4000 F during a standard heating cycle. The measured temperatures, which were well below the predicted service limits given in this report for the silicon-carbide coating system, suggest that a silicon-carbide coated element concept warrants further study.

DTIC

Graphite; Heating; Temperature Measurement; Hypervelocity Wind Tunnels; Real Time Operation

12

ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see 91 Lunar and Planetary Exploration.

19980009498 National Academy of Sciences - National Research Council, Committee on Use of the International Space Station for Engineering Research and Technology, Washington, DC USA

Engineering Research and Technology Development on the Space Station *Final Report*

May 1996; 89p; In English

Contract(s)/Grant(s): NASw-4938

Report No.(s): NASA/CR-96-206743; NAS 1.26:206743; PB96-189337; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report identifies and assesses the kinds of engineering research and technology development applicable to national, NASA, and commercial needs that can appropriately be performed on the space station. It also identifies the types of instrumentation that should be included in the space station design to support engineering research. The report contains a preliminary assessment of the potential benefits to U.S. competitiveness of engineering research that might be conducted on a space station, reviews NASA's current approach to jointly funded or cooperative experiments, and suggests modifications that might facilitate university and industry participation in engineering research and technology development activities on the space station.

NTIS

Product Development; Research and Development; Spacecraft Design; International Space Station; Engineering

19980010889 Air War Coll., Maxwell AFB, AL USA

SPACENET: On-Orbit Support in 2025

Bradley, Bill, Air War Coll., USA; Block, Carl, Air War Coll., USA; Chavez, Rich, Air War Coll., USA; Simonsen, Phil, Air War Coll., USA; Zadalis, Tim, Air War Coll., USA; Aug. 1996; 79p; In English

Report No.(s): AD-A331992; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In 2025, on-orbit support will be vital to employing space assets as an instrument of national power. Four areas of on-orbit support need to be developed over the next three decades to ensure that the US maintains space dominance. These four key areas together form the Spacenet 2025 system. This paper examines these four areas in the context of supporting space assets. First, support to the war fighters will be the priority of the military space program. The theater commander requires reliable, timely support from space to utilize all war fighting assets. This space support includes communications, navigation, weather, missile launch warning, and data transfer. Although intelligence is not addressed in this report, on-orbit support provides sufficient processing, storage, and transmission capability to fully support the intelligence architecture. Second, the satellite command, control, and communication (C3) system must be responsive enough to position satellites in the correct orbits to support the theater commander. This requires: C3 systems to control satellites over the horizon from the ground control station; automatic, redundant switching to ensure that a particular satellite receives the correct commands; and flexible, secure, and mobile ground stations. Satellite autonomy is the ultimate goal, however, when required, ground control is minimized. Third, satellite design is critical. Improved design lowers cost, increases flexibility, and enhances survivability. Key design considerations include satellite size, longevity, power and propulsion requirements, radiation hardened electronics, satellite autonomy, and satellite disposal. Finally, space assets must be survivable in a hostile space environment and immediately replaceable if destroyed. Satellite security

employs both passive and active defenses to counter manmade and environmental threats such as space debris, antisatellite systems (ASAT), or meteorites.

DTIC

Satellite Communication; Command and Control; Military Technology

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbital and launching dynamics.

19980010871 Phillips Lab., Kirtland AFB, NM USA

Orbit Analysis Software Index, Volume 2 Final Report, Jun. 1995 - Dec. 1996

Boelitz, Carole A., Phillips Lab., USA; Beck, Eric V., Phillips Lab., USA; Jul. 08, 1997; 278p; In English

Contract(s)/Grant(s): AF Proj. 8809

Report No.(s): AD-A331416; PL-TR-95-1139-Rev-1-Vol-2; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

One goal of the Astrodynamics Division is to provide information on basic, standardized orbit analysis tools for Phillips Laboratory and AF space systems. The purpose of this orbit analysis survey is to list and measure the capabilities of existing commercial-off-the-shelf(COTS) and government furnished orbit analysis software packages. Consequently, military and civilian personnel can determine the best software package or complementary set of software packages to fulfill their needs while reducing acquisition costs and the need for in-house software support.

DTIC

Aerospace Systems; Applications Programs (Computers); Standardization; Surveys

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; operating problems of launch/space vehicle systems; and reusable vehicles. For related information see also 20 Spacecraft Propulsion and Power.

19980009520 Army Research Lab., Aberdeen Proving Ground, MD USA

Plasma Characterization for Electrothermal-Chemical (ETC) Gun Applications Final Report, Jun. 1993 - Jun. 1994

White, Kevin J., Army Research Lab., USA; Katulka, Gary L., Army Research Lab., USA; Khong, Thuan, Army Research Lab., USA; Nekula, Kevin, Army Research Lab., USA; Sep. 1997; 50p; In English

Report No.(s): AD-A330007; ARL-TR-1491; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Successful application of the ElectroThermal Chemical (ETC) propulsion concept will require an understanding of the propagation and interaction of plasmas in propellant beds. This information is necessary to exploit the ignition and combustion control that is possible with plasmas. Toward this end, an experimental program was designed to gain an understanding of the functioning of the plasma and the interaction of the plasma with the propelling charge, and family a series of 30-mm gun tests, incorporating the experience gained in the first two parts of the program, was conducted. This report describes the results of the first two parts of this program. Here results are described of tests on different igniter centercore configurations to be used for distributing the electrical plasma within the combustion chamber. High speed photographic measurements were made of open air firings (with various centercore designs) and in a 30 mm gun simulator. Propagation velocities along with the time sequence of events for the functioning in the centercore tubes were recorded. High axial pressure gradients were observed, necessitating mechanically robust centercores. Radiation levels substantially in excess of conventional igniters were also noted. These observations were exploited in the design of a plasma distribution centercore for 30 mm gun tests.

DTIC

Plasmas (Physics); Chemical Propulsion; Fire Control

19980009791 Air Univ., School of Advanced Airpower Studies, Maxwell AFB, AL USA

Concepts of Operations for a Reusable Launch Vehicle

Rampino, Michael A., Air Univ., USA; Sep. 1997; 59p; In English

Report No.(s): AD-A330029; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The USA is embarked on a journey toward maturity as a spacefaring nation. One key step along the way is development of a reusable launch vehicle (RLV). The most recent National Space Transportation Policy (August 1994) assigned improvement

and evolution of current expendable launch vehicles to the Department of Defense while National Aeronautical Space Administration (NASA) is responsible for working with industry on demonstrating RLV technology. The purpose of this study is to help ensure the US military, especially the USAF, is prepared to take advantage of RLVs should the NASA-led effort to develop an RLV demonstrator prove successful. The focus of this study is an explanation of how the US military could use RLVs, by describing and analyzing two concepts of operations. Four major conclusions resulted from the analysis. First, RLVs have military potential. They can perform a variety of missions including responsive spacelift, reconnaissance, and strike. However, the economic feasibility of using RLVs for earth-to-earth transportation is questionable. Second, design choices for an operational RLV will have effects on risk, cost, capability, and operations efficiency. Trade-offs will have to be made between NASA, commercial, and military requirements if all three parties are to use the same fleet of RLVs. Third, increased investment in propulsion technology development is warranted to ensure success. Fourth, the top priority for the RLV program, even from the military's perspective, should remain cheap and responsive access to space. The research led to three recommendations. First, the US military should become a more active participant in the RLV program to ensure its requirements are defined and incorporated. Second, America should not pursue development of operational RLVs before the technology is ready.

DTIC

Reusable Launch Vehicles; Space Transportation; Management Planning

16

SPACE TRANSPORTATION

Includes passenger and cargo space transportation, e.g., shuttle operations; and space rescue techniques. for related information see also 03 Air Transportation and Safety and 18 Spacecraft Design, Testing and Performance. For space suits see 54 Man/System Technology and Life Support

19980009787 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 02 Highlights

Nov. 29, 1997; In English; Videotape: 11 min. 11 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113441; BRF-1412B; NONP-NASA-VT-1997125962; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this second day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk are seen conducting experiments involving the effect of weightlessness on materials and fluids. They also work with an experiment to study Earth's protective ozone layers.

CASI

Space Transportation System; Space Transportation System Flights; Spacecrews; Space Shuttle Payloads; Space Shuttles; Space Shuttle Missions; Space Shuttle Orbiters; Weightlessness

19980009788 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 03 Highlights

Nov. 21, 1997; In English; Videotape: 12 min. 22 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113442; BRF-1412C; NONP-NASA-VT-1997125963; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this third day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk deploy the Spartan satellite with the shuttle's robot arm.

CASI

Space Transportation System; Space Transportation System Flights; Orbital Servicing; Payload Assist Module; Remote Manipulator System; Space Shuttle Main Engine; Space Shuttle Orbiters; Space Shuttle Missions

19980009789 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 05 Highlights

Nov. 23, 1997; In English; Videotape: 12 min. 35 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113444; BRF-1412E; NONP-NASA-VT-1997125965; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this fifth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk continue experimental work aboard Columbia. Leonid Kadenyuk focuses on studies of plant growth in weightlessness.

CASI

Space Transportation System; Space Transportation System Flights; Space Shuttle Main Engine; Space Shuttle Missions; Space Shuttle Orbiters; Space Shuttle Payloads

19980009790 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 08 Highlights

Nov. 26, 1997; In English; Videotape: 14 min. 12 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113447; BRF-1412H; NONP-NASA-VT-1997125968; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this eighth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk take time out from their duties to be interviewed by CNN. As they reach the one week mark in their 16-day flight, the STS-87 crew shift the focus of their efforts towards the variety of science experiments flying on this mission.

CASI

Space Transportation System; Space Transportation System Flights; Payload Delivery (STS); Payload Integration Plan; Space Shuttles; Space Shuttle Payloads; Space Shuttle Orbiters; Space Shuttle Missions

19980009826 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 04 Highlights

Nov. 22, 1997; In English; Videotape: 15 min. 11 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113443; BRF-1412D; NONP-NASA-VT-1997125964; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this fourth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk check out the spacesuits for the EVA planned for later during the mission. Mission Control developed plans that may allow Scott and Doi to recapture the Spartan satellite by hand during that EVA.

CASI

Extravehicular Activity; Space Transportation System; Space Transportation System Flights; Space Shuttle Main Engine; Space Shuttle Missions; Space Shuttle Orbiters

19980009827 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 15 Highlights

Dec. 03, 1997; In English; Videotape: 14 min. 3 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113439; BRF-1412P; NONP-NASA-VT-1997125960; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this fifteenth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk spend a good part of their day checking out the important space craft systems that are needed to support reentry.

CASI

Space Transportation System; Space Transportation System Flights; Spacecrews; Space Shuttles

19980009830 NASA Johnson Space Center, Houston, TX USA

STS-86 Mission Highlights Resources Tape

Nov. 21, 1997; In English; Videotape: 1 hr. 56 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-206104; JSC-1686; NONP-NASA-VT-1997093224; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

The flight crew of the STS-86 mission, Cmdr. James D. Wetherbee, Jr., Pilot Michael J. Bloomfield, Mission Specialists Scott E. Parazynski, Jean-Loup Chretien, Vladimir G. Titov, Wendy B. Lawrence and Mike Foale present an overview of their mission, whose primary objective is the rendezvous and space docking with the Russian Space Station Mir. Video film footage includes:

prelaunch and launch activities; shuttle launch; in-orbit rendezvous; docking between Mir and the orbiter; general crew activities; transfer of supplies; undocking maneuvers and a Mir fly-around; and the reentry and landing of the orbiter.

CASI

Space Transportation System; Spacecraft Docking; Spacecraft Launching; Spacecrews; Supplying; Mir Space Station

19980009908 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 01 Highlights

Nov. 18, 1997; In English; Videotape: 15 min. 25 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113440; BRF-1412A; NONP-NASA-VT-1997125961; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this first day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk can be seen performing pre-launch activities such as eating the traditional breakfast, crew suit-up, and the ride out to the launch pad. Also, included are various panoramic views of the shuttle on the pad. The crew is seen being readied in the white room' for their mission. After the closing of the hatch and arm retraction, launch activities are shown including countdown, engine ignition, launch, and the separation of the Solid Rocket Boosters.

CASI

Space Shuttle Boosters; Space Transportation System; Space Transportation System Flights; Spacecrews; Countdown; Payload Delivery (STS); Payload Retrieval (STS); Space Shuttle Main Engine; Space Shuttle Orbiters; Space Shuttle Payloads

19980009909 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 14 Highlights

Dec. 02, 1997; In English; Videotape: 15 min. 50 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113438; BRF-1412N; NONP-NASA-VT-1997125959; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this fourteenth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk focus on completion of hands-on sample processing in the microgravity glovebox facility. They also prepare the spacesuits and tools that will be used for the EVA by Scott and Doi. The crew take time out from their schedule to discuss the mission with reporters from the U.S., Japan and the Ukraine during the traditional in-flight news conference.

CASI

Extravehicular Activity; Microgravity; Space Transportation System; Space Transportation System Flights; Spacecrews; Ukraine

19980009910 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 12 Highlights

Nov. 30, 1997; In English; Videotape: 13 min. 47 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113436; BRF-1412L; NONP-NASA-VT-1997125957; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this twelfth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk continue to look at how plant growth and composite materials are affected by microgravity. The astronauts use the globebox facility to process samples for the Particle Engulfment and Pushing by a Solid/Liquid Interface experiment.

CASI

Space Transportation System; Space Transportation System Flights; Spacecrews; Vegetation Growth

19980009911 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 11 Highlights

Nov. 29, 1997; In English; Videotape: 9 min. 31 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113435; BRF-1412K; NONP-NASA-VT-1997125956; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this eleventh first day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk continue to look at how plant growth and composite materials are affected by microgravity. The astronauts will use the Middeck Globebox Facility

to process samples for the Particle Engulfment and Pushing by a Solid/Liquid Interface experiment. PEP is studying the formation of composite materials, attempting to accurately map the roles of gravity-induced convection and sedimentation in the process by removing the gravity from the equation.

CASI

Microgravity; Space Transportation System; Space Transportation System Flights; Spacecrews; Vegetation Growth

19980009912 NASA Johnson Space Center, Houston, TX USA

STS-87 Day 10 Highlights

Nov. 28, 1997; In English; Videotape: 15 min. 5 sec. playing time, in color, with sound

Report No.(s): NASA/TM-97-113434; BRF-1412J; NONP-NASA-VT-1997125955; No Copyright; Avail: CASI; A02, Videotape-VHS; A22, Videotape-Beta

On this tenth day of the STS-87 mission, the flight crew, Cmdr. Kevin R. Kregel, Pilot Steven W. Lindsey, Mission Specialists Winston E. Scott, Kalpana Chawla, and Takao Doi, and Payload Specialist Leonid K. Kadenyuk receive a call from Ukrainian President Leonid Kuchma and answer questions from media in Kiev. The conversations focus on Kadenyuk's first flight into space and the work ongoing to support the mission objectives.

CASI

Space Transportation System; Space Transportation System Flights; Spacecrews; Space Shuttle Main Engine; Space Shuttles

17

SPACE COMMUNICATIONS, SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation and guidance; and radio blackout. For related information see also 04 Aircraft Communications and Navigation and 32 Communications and Radar.

19980009904 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA

Thermal Analysis of a Subminiature Telemetry Sensor Mounted in a Kinetic Energy Projectile Base Final Report

Hollis, M. S. L., Army Research Lab., USA; Guidos, B. J., Army Research Lab., USA; Conroy, P. J., Army Research Lab., USA; Aug. 1997; 39p; In English

Report No.(s): AD-A330053; TR-1425; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A computational thermal analysis is presented for a hardened subminiature telemetry sensor system (HSTSS) mounted in the tracer well of a large caliber fin stabilized kinetic energy projectile. The HSTSS discussed here is designed to provide a record of roll history. The in-bore and in-flight projectile surface heat transfer conditions are adapted from two previous studies in numerical interior ballistic and computational aerodynamics. The combined heat transfer model is used in the present study to provide boundary conditions for computations of surface and in-depth transient thermal response of the HSTSS components. A two-dimensional axisymmetric multiple material numerical approach is used to model the HSTSS and projectile base over the complete in-bore and in-flight event. A one-dimensional numerical approach with a surface melt condition is used to model the protective plastic radome on the HSTSS while in bore. A one-dimensional analytical approach for high speed melting is presented and compared to the numerical model. The analysis allows a pre-test evaluation to be made of the thermal integrity of the HSTSS design for a large caliber launch and flight environment.

DTIC

Thermal Analysis; Mathematical Models; Projectiles; Transmitters; Telemetry

19980010445 Range Commanders Council, Telemetry Group, White Sands Missile Range, NM USA

Test Methods for Telemetry Systems and Subsystems, Volume 2, Test Methods for Telemetry RF Subsystems

Jun. 1997; 317p; In English

Report No.(s): AD-A331419; RCC-118-97-Vol-2; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

The Telemetry Group of the RCC has prepared this document to provide common methods for testing radio frequency (RF) equipment. The use of common methods should minimize problems when organizations exchange test results. Other volumes of this document address test methods for recorder/reproducer systems and magnetic tape, data multiplex equipment and vehicle telemetry systems. The Telemetry Standards and the Telemetry Applications Handbook are companion documents.

DTIC

Data Processing Equipment; Multiplexing; Radio Frequencies; Telemetry

SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes satellites; space platforms; space stations; spacecraft systems and components such as thermal and environmental controls; and attitude controls. For life support systems see 54 Man/System Technology and Life Support. For related information see also 05 Aircraft Design, Testing and Performance, 39 Structural Mechanics, and 16 Space Transportation.

19980009822 National Telecommunications and Information Administration, Boulder, CO USA

Link Analysis for the LRPT Digital Weather Satellite System

Dalke, R. A., National Telecommunications and Information Administration, USA; Achatz, R. J., National Telecommunications and Information Administration, USA; Holloway, C. L., National Telecommunications and Information Administration, USA; Hufford, G. A., National Telecommunications and Information Administration, USA; Quincy, E. A., National Telecommunications and Information Administration, USA; Sep. 1997; 55p; In English

Report No.(s): PB97-209415; NTIA-97-341; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The National Oceanic and Atmospheric Administration, the European Space Agency, and the European Organization for the Exploitation of Meteorological Satellites are designing a weather satellite system that will broadcast digital weather images at VHF. As a part of that effort, the Institute for Telecommunication Sciences has analyzed the VHF digital communications link. The results of the link analysis are described in the report. This analysis is based on published literature and models that describe propagation effects such as ionospheric scintillation and man-made noise, and are applicable to VHF digital communications. The analysis includes the estimation of the required link margins for coded binary and quaternary phase-shift modulation methods.

NTIS

Communication Networks; Digital Systems; European Space Agency; Telecommunication; Pulse Communication; Meteorological Satellites; Data Links

19980010014 Naval Research Lab., Systems Engineering Staff, Washington, DC USA

Analysis of SLR Targets for JASON Final Report

Gilbreath, G. C., Naval Research Lab., USA; Rolsma, Peter B., Naval Research Lab., USA; Sep. 30, 1997; 53p; In English
Report No.(s): AD-A330181; NRL/MR/8120--97-7971; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report provides preliminary results pertaining to the applicability to the JASON program of a retroreflector array designed, built, and space qualified by the Naval Research Laboratory for Low Earth Orbiting spacecraft. In this report, we will describe the assumptions we used for link analysis as they pertain to Passes 44 and 85 over Capraia Island. We provide figures and discussions pertinent to a single retroreflector's performance and the array's performance over the site. We also include a description and photo of the array itself, as well as the test and levels used to space qualify the array.

DTIC

Design Analysis; Arrays; Low Altitude; Defense Program; Spacecraft Defense

19980010117 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Reorientations of Flexible Spacecraft Using Momentum Exchange Devices

Ford, Kevin A., Air Force Inst. of Tech., USA; Sep. 1997; 148p; In English

Report No.(s): AD-A329676; AFIT/DS/ENG/97-07; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

We study rest-to-rest reorientations of flexible spacecraft using momentum exchange devices. A new and concise form of the equations of motion for a rigid body containing a cluster of gimballed momentum wheels is developed using the Euler-Newton approach. Special restrictions of the gimballed momentum wheel equations yield equations of motion for the momentum wheel cluster and the control moment gyroscope cluster. A mathematical model of a free spacecraft with Euler-Bernoulli appendages is developed. Using the assumed modes method, a complete set of equations is developed which describes the dynamics of a spacecraft with flexible appendages and gimballed momentum wheels. Special attention is paid to singularity problems in control moment gyro clusters. A control law based on the singular value decomposition is developed which avoids torque output commands in the nearly singular direction. The stationary platform maneuver, a maneuver along the set of equilibrium solutions of a zero angular velocity spacecraft, is extended to the control moment gyro cluster. The set of equilibria for a control moment gyro cluster is a unique surface in gimbal angle space. A control law which reorients the spacecraft while remaining close to this surface is developed using a Lyapunov method.

DTIC

Control Moment Gyroscopes; Control Theory; Decomposition; Equations of Motion; Flexible Spacecraft

19980010429 NERAC, Inc., Tolland, CT USA

Space Infrared Telescope Facility Satellite. (Latest Citations from the NTIS Bibliographic Database)

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-861216; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development and mission of the Space Infrared Telescope Facility (SIRTF) satellite. Topics include design, performance, and evaluation of data received from space. The astronomical and astrophysical aspects of SIRTF are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Space Infrared Telescope Facility

19980010568 NERAC, Inc., Tolland, CT USA

Advanced Satellite for Cosmology and Astrophysics (ASCA). (Latest Citations from the INSPEC Database)

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-858949; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the ASCA flights and evaluation of data for use in future space probes. Topics include mission planning, scheduling, and performance. X-ray studies and findings of ASCA are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Astronomical Satellites

19980011650 Naval Postgraduate School, Monterey, CA USA

Active Vibration Control of Flexible Structures Using the Modular Control Patch (MCP)

Schmidt, Steven P., Naval Postgraduate School, USA; Mar. 1997; 120p; In English

Report No.(s): AD-A331713; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Active vibration control has been increasingly used as a solution for spacecraft structures to achieve the degree of vibration suppression required for precision pointing accuracy that is not easily achieved with passive damping. This thesis examines the effectiveness and suitability of the Modular Control Patch (MCP) to achieve active vibration control on flexible structures. The MCP was developed by TRW for the USA Air Force and uses a digital signal processor to implement control algorithms. The objective of the MCP program was to design a miniaturized multi-channel digital controller suitable for space-based vibration control. Three different control laws: Positive Position Feedback (PPF), Strain Rate Feedback (SRF), and Integral control were realized using the MCP. These control laws were used independently and in combination in order to discover the most effective damping for the first two modal frequencies on a cantilevered aluminum beam. Two PPF filters in parallel provided the most effective multi-mode damping. Further experiments tested the robustness of the PPF control law implemented by the MCP. Increasing the compensator damping greatly improved PPF robustness and expanded its capability as an effective controller.

DTIC

Active Control; Vibration Damping; Spacecraft Structures; Flexible Bodies

19980011984 NERAC, Inc., Tolland, CT USA

Small Satellites. (Latest citations from the NTIS Bibliographic Database)

Nov. 1997; In English; page count unavailable.

Report No.(s): PB98-851074; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, manufacture, and assessment of small satellites for multi-user and multi-data services. Cost and weight reduction, microminiaturization, cost-effective propulsion systems, microelectronics, micro-rockets, and microthrusters are discussed. References also review satellite launching, attitude control, high performance computers, power supplies, laser applications, scientific satellites, and spaceborne experiments.

NTIS

Communication Satellites; Scientific Satellites; Design Analysis; Manufacturing; Cost Effectiveness; Weight Reduction

SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components, e.g., rocket engines; and spacecraft auxiliary power sources. For related information see also 07 Aircraft Propulsion and Power, 28 Propellants and Fuels, 44 Energy Production and Conversion, and 15 Launch Vehicles and Space Vehicles.

19980010112 Hampton Univ., Dept. of Physics, VA USA

Development of Advanced Thermal and Electric Propulsion (TEP) System *Final Report, 30 Sep. 1993 - 29 Sep. 1994*

Tabibi, Bagher M., Hampton Univ., USA; Nov. 25, 1994; 50p; In English

Contract(s)/Grant(s): F49620-93-I-0611; AF Proj. 2308

Report No.(s): AD-A329705; AFOSR-97-0443TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

On September 30, 1993, the Department of Physics at Hampton University was awarded a research instrumentation grant by the AFOSR for the development of an advanced Thermal and Electric Propulsion (TEP) system. Under this grant, a TEP test facility capable of providing 60-kW optical power for thermal propulsion and 30-kW electric power for the magnetoplasmadynamic (MPD) thruster has been constructed and installed. The TEP is literally of thermal and electric propulsion systems in a tandem order to take advantage of both systems. The TEP employs a high temperature thermal chamber for generation of an ionized propellant and a hollow cathode of the MPD as an expansion nozzle. Both feature alleviate the requirement of high voltage triggering and concentration of the current density on the solid cathode tip that commonly appear in the conventional MPD thrusters.

DTIC

Electric Propulsion; Solar Thermal Propulsion

19980010185 Aerospace Corp., Environmental Programs, El Segundo, CA USA

Eliminating the Use of Ozone Depleting Substances in Solid Rocket Motor Manufacturing

Sheaffer, Gail, Aerospace Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 3-11; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Ozone depleting substances (ODSs) are used throughout the world in the manufacture of solid rocket motors. The primary ODSs used are TCA (1,1,1-trichloroethane) and CFC-113 (chlorofluorocarbon-113). These substances are used because of their excellent cleaning properties, low toxicity, chemical stability, and non-flammability. The solid rocket motor industry has creatively and aggressively tested, verified, and implemented a number of ODS elimination steps to reduce over 1.6 million pounds of annual use. A handbook was prepared as a collaborative effort of four USA large solid rocket motor manufacturers to detail success stories to date. The Handbook serves as a resource to further reduce dependence on ODSs in solid rocket motor manufacturing internationally and in other industries with similar processes. Case studies and details of ODS elimination, technical challenges preventing ODS elimination, and descriptions of the corporate implementation steps that manufacturers used to accomplish the ODS elimination are discussed.

Author

Solid Propellant Rocket Engines; Manufacturing; Ozone Depletion; Chlorofluorocarbons; Cleaning; Environment Effects

19980010188 Army Missile Command, Redstone Arsenal, AL USA

The Green Missile Program

Hagler, Diane B., Army Missile Command, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 31-34; In English; Also announced as 19980010184

Contract(s)/Grant(s): PP1058/7; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The Green Missile Program is a Tri-Service/DOE/EPA pollution prevention research effort to eliminate major sources of toxic/hazardous materials used in solid rocket propulsion systems. Based on regulatory impact, an interagency team prioritized environmental research needs for solid propulsion systems. Three high priority research tasks were submitted and approved for FY 97 funding under the Strategic Environmental Research and Development Program (SERDP). These tasks are: (1) elimination of lead in minimum smoke propellants; (2) elimination of HCl as a combustion product; and (3) minimization of solvents used in energetic oxidizer processing.

Author

Solid Propellant Rocket Engines; Environment Effects; Missiles; Hydrochloric Acid; Lead (Metal); Solid Propellants; Solvents; Rocket Oxidizers; Propulsion; Pollution Control

19980010211 Thiokol Corp., Brigham City, UT USA

Solid Rocket Exhaust Cloud Modeling and Verification Measurements

Bennett, R. R., Thiokol Corp., USA; Whimpey, J. R., Thiokol Corp., USA; Hayes, R. W., El Dorado Engineering, Inc., USA; Frandsen, R., El Dorado Engineering, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 229-238; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

A considerable effort has been expended in the development and verification of computer models to determine the fate of exhaust clouds produced by the combustion of solid rocket propellants. One of the species of greatest interest has been HCl, since it is considered a hazardous air pollutant by the EPA. Three computer models, REEDM, INPUFF, and PCAD, have been used to predict the location and concentration of exhaust clouds of various rocket motors. Thiokol Corp. has recently commissioned El Dorado Engineering to compile and summarize their history of field measurements on solid rocket motor static tests and propellant open burns. Part of this effort was directed towards PCAD model validation. The data showed the PCAD model to predict plume rise height, the location of maximum exhaust cloud ground concentration, and the value of the maximum concentration quite well at least within a factor of two in most tests. In addition, SECOR International, Inc. has conducted side by side comparisons of INPUFF and REEDM, and finds REEDM to generally predict higher concentrations of exhaust species, apparently due to a lower calculated plume rise. Recent experimental measurements of Titan launches have also shown an under prediction of plume rise height by REEDM. Some of the concerns with the REEDM program as evaluated by El Dorado Engineering are noted, including incorrect source terms. Since launch decisions are made based on REEDM output, it is important that it be as accurate as possible.

Author

Computerized Simulation; Environment Effects; Combustion Products; Exhaust Gases; Hydrochloric Acid; Rocket Exhaust; Solid Propellant Combustion; Exhaust Clouds; Rocket Launching; Engine Tests; Atmospheric Models

19980010215 NASA Marshall Space Flight Center, Huntsville, AL USA

Methyl Chloroform Elimination from the Production of Space Shuttle Solid Rocket Motors

Golde, Rick P., Thiokol Corp., USA; Burt, Rick, NASA Marshall Space Flight Center, USA; Key, Leigh, NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 263-275; In English; Also announced as 19980010184; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A06, Microfiche

Thiokol Space Operations manufactures the Reusable Solid Rocket Motors used to launch America's fleet of Space Shuttles. In 1989, Thiokol used more than 1.4 Mlb of methyl chloroform to produce rocket motors. The ban placed by the Environmental Protection Agency on the sale of methyl chloroform had a significant effect on future Reusable Solid Rocket Motor production. As a result, changes in the materials and processes became necessary. A multiphased plan was established by Thiokol in partnership with NASA's Marshall Space Flight Center to eliminate the use of methyl chloroform in the Reusable Solid Rocket Motor production process. Because of the extensive scope of this effort, the plan was phased to target the elimination of the majority of methyl chloroform use (90 percent) by January 1, 1996, the 3 Environmental Protection Agency deadline. Referred to as Phase I, this effort includes the elimination of two large vapor degreasers, grease diluent processes, and propellant tooling handcleaning using methyl chloroform. Meanwhile, a request was made for an essential use exemption to allow the continued use of the remaining 10 percent of methyl chloroform after the 1996 deadline, while total elimination was pursued for this final, critical phase (Phase II). This paper provides an update to three previous presentations prepared for the 1993, 1994, and 1995 CFC/Halon Alternative Conferences, and will outline the overall Ozone Depleting Compounds Elimination Program from the initial phases through the final testing and implementation phases, including facility and equipment development. Processes and materials to be discussed include low-pressure aqueous wash systems, high-pressure water blast systems- environmental shipping containers, aqueous and semi-aqueous cleaning solutions, and bond integrity and inspection criteria. Progress toward completion of facility implementation and lessons learned during the scope of the program, as well as the current development efforts and basic requirements of future methyl chloroform handcleaning elimination, will also be outlined.

Author

Aqueous Solutions; Chloroform; Methyl Compounds; Environment Effects; Reusable Rocket Engines; Cleaners; Environment Protection; Chemical Cleaning

19980010594 Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA

ARO and AFOSR Contractors Meeting in Chemical Propulsion, 1 Jun. 1996 - 31 May 1997

Mann, David M., Air Force Office of Scientific Research, Bolling AFB, USA; Tishkoff, Julian M., Air Force Office of Scientific Research, Bolling AFB, USA; Aug. 19, 1997; 194p; In English

Report No.(s): AD-A330003; AFOSR-TR-97-0514; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

Abstracts are given for research in chemical propulsion supported by the Air Force Office of Scientific Research and the Army Research Office.

DTIC

Abstracts; Chemical Propulsion; Contractors; Research Projects; Diesel Engines; Gas Turbines

19980011995 Operational Technologies Corp., Dayton, OH USA

Launch Area Toxic Risk Analysis Program (LATRA) Toxicology Review Final Report, Jul. - Dec. 1996

Prince, Joseph K., Operational Technologies Corp., USA; Sterner, Teresa R., Operational Technologies Corp., USA; Vermulen, Erik K., Operational Technologies Corp., USA; Dec. 1996; 185p; In English

Contract(s)/Grant(s): F41624-94-D-9003; F41624-94-D-9005; AF Proj. 7757

Report No.(s): AD-A332950; AL/OE-TR-1996-0154; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The toxic cloud corridors generated during normal and catastrophic rocket launch scenarios and the possible human health effects are a source of concern to the US Air Force. Therefore, a literature search of three species of rocket emissions was performed to identify health effects information useful to HQ Space Command for managing the risk from these toxic clouds. The literature retrieved on the three compounds of interest, hydrogen chloride (HCl), nitrogen oxides (NO_x) and nitric acid (HNO₃), was evaluated to identify the toxic responses associated with inhalation from such exposures. Animal and human data generated in acute toxicity studies were assessed, indicating the respiratory track was the target of exposure to these compounds. Based upon the available toxicity information, acceptable levels of exposure were proposed. The toxicological information data bases under review and proposed recommendations were presented for consideration to the National Research Council National Academy of Science, Committee on Toxicology.

DTIC

Toxicity; Rocket Exhaust; Risk

23

CHEMISTRY AND MATERIALS (GENERAL)

19980009905 Pittsburgh Univ., Pittsburgh, PA USA

Cross-Disciplinary Materials Research Program Final Report, 1 Feb. 1995 - 30 Apr. 1997

Pettit, F. S., Pittsburgh Univ., USA; Yates, J. T., Jr, Pittsburgh Univ., USA; Jul. 31, 1997; 210p; In English

Contract(s)/Grant(s): F49620-95-I-0167

Report No.(s): AD-A329600; AFOSR-TR-97-0335; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This Final Report describes the research progress in the Cross-Disciplinary Materials Program at the University of Pittsburgh during the period February 1, 1995 through April 30, 1997. Research has been Undertaken in three technical areas; High Performance Materials, Optoelectronics, and Catalysis. The projects in High Performance Materials include studies on the oxidation of superalloys, coatings, and other intermetallics, the thermoprocessing of near gamma-TiAl, the wear of diamond films and monitoring diamond growth with UV Raman Spectroscopy, the modeling of blending and the modeling of adhesion of polymers, and the attempt to remove sulfur from liquid metals. Optoelectronics projects are concerned with multi-quantum well devices, polymerized crystalline colloidal arrays to be developed for laser eye protection, synthesis of non-linear metallo-organic compounds, determination of carrier concentration in n-type H and 6HSiC, and an electron beam method for growing epitaxial SiC. The Catalysis projects are involved with a new automotive catalyst for decomposition of NO_x, studies of the dechlorination of chlorofluorocarbons, the synthesis of new transition metal compounds for catalysts, and the results of using hydroxyapatite and fluorohydroxyapatite for decomposition of nerve gas.

DTIC

Adhesion; Automobiles; Carrier Density (Solid State); Catalysis; Colloids; Diamond Films; Electro-Optics; Electron Beams; Heat Resistant Alloys; Intermetallics

19980010184 NASA Marshall Space Flight Center, Huntsville, AL USA

Second Aerospace Environmental Technology Conference

Whitaker, A. F., Editor, NASA Marshall Space Flight Center, USA; Clark-Ingram, M., Editor, NASA Marshall Space Flight Center, USA; Mar. 1997; 732p; In English; 2nd; Aerospace Environmental Technology, 6-8 Aug. 1996, Huntsville, AL, USA; Sponsored by NASA Marshall Space Flight Center, USA; Also announced as 19980010185 through 19980010258; Meeting Sponsored in part by American Society of Metals, International

Report No.(s): NASA-CP-3349; M-827; NAS 1.55:3349; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

The mandated elimination of CFC'S, Halons, TCA, and other ozone depleting chemicals and specific hazardous materials has required changes and new developments in aerospace materials and processes. The aerospace industry has been involved for several years in providing product substitutions, redesigning entire production processes, and developing new materials that minimize or eliminate damage to the environment. These activities emphasize replacement cleaning solvents and their application, verification, compliant coatings including corrosion protection system and removal techniques, chemical propulsion effects on the environment, and the initiation of modifications to relevant processing and manufacturing specifications and standards.

Author

Aircraft Construction Materials; Environment Effects; Ozone Depletion; Conferences; Spacecraft Construction Materials; Replacing; Product Development

19980010742 NASA Langley Research Center, Hampton, VA USA

National Educators' Workshop: Update 1996

Gardner, James E., NASA Langley Research Center, USA; Freeman, Ginger L., NASA Langley Research Center, USA; Jacobs, James, Norfolk State Univ., USA; Parkin, Don M., Los Alamos National Lab., USA; National Educators' Workshop: Update 1996; Jul. 1997; 565p; In English; Standard Experiments in Engineering Materials Science and Technology, 27-30 Oct. 1996, Los Alamos, NM, USA; Sponsored by NASA Washington, USA; Also announced as 19980010743 through 19980010782

Contract(s)/Grant(s): RTOP 243-50-01-01

Report No.(s): NASA-CP-3354; L-17639; NAS 1.55:3354; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

This document contains a collection of experiments presented and demonstrated at the National Educators' Workshop: Update 96, held at Los Alamos National Laboratory, Los Alamos, New Mexico on October 27-30, 1996. The experiments related to the nature and properties of engineering materials and provided information to assist in teaching about materials in the education community.

Author

Conferences; Education; Materials Science; Materials Tests

19980010743 Los Alamos National Lab., Center for Materials Science, NM USA

Los Alamos: The Challenging World of Nuclear Materials Science

Parkin, Don, Los Alamos National Lab., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 1-26; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Los Alamos National Laboratory is operated for the Department of Energy by the University of California. At Los Alamos the central mission of reducing the nuclear danger supports a set of core technical competencies that contributes to civilian and industrial needs. In turn, the intellectual challenges of civilian and industrial problems strengthen the core competencies for the defense missions in an area of declining resources. This paper discusses research done on the thermal, mechanical, and physical properties of nuclear materials.

CASI

Nuclear Chemistry; Mechanical Properties; Thermodynamic Properties; Physical Properties; Laboratories

19980010757 California State Univ., Mechanical Engineering, Los Angeles, CA USA

From Rugs to Demonstrations in Engineering Materials Class

Fabris, Neda S., California State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 227-237; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

All engineering students encounter, in at least one of their classes, concepts of stress, deformation and strain. This subject is a main topic in mechanics of materials class, and it is a basis of mechanical and civil engineering design. The mechanical properties of engineering materials is one of the most important topics in materials of engineering class and in many curricula, the laboratory testing of engineering materials is performed. Still the obvious connection between these two concepts i.e. stress in the part and strength of the part is hard to distinguish. Students learn to compute stress in the material using mathematical equations that often do not give them feeling for actual deformation of the part. However, the concept of the normal and shear stress can be easily visualized using simple pieces of cloth, tape Styrofoam cup, pencil, marker, thread and paper clip, coins or other weights. Some other concepts in material science can also be easily demonstrated and remembered using pieces of cloth, glue, scissors and a little time and patience.

Author

Deformation; Students; Stress-Strain Relationships; Shear Stress; Education

19980010773 General Atomics Co., Education Foundation, San Diego, CA USA

Explorations in Materials Science

Gulden, Terry D., General Atomics Co., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 407-415; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The materials science teaching unit is based on a study of three basic types of materials; polymers represented by polyester, metals represented by tin, and ceramics represented by an anchor cement. The materials were chosen based on their ready availability, low cost, non-toxic nature, and ease of use by the teachers and students. The students fabricate test bars of the materials, perform characterization tests of physical, chemical, mechanical, and transport properties, collect and analyze data, and report the results. Some of the more unique experiments developed for the teaching module will be described, including; fabrication of test bars, heat conduction, creep of tin, viscoelastic relaxation of polymers, and electrical circuit analogues using lines drawn with a graphite pencil.

Author

Materials Science; Viscoelasticity; Conductive Heat Transfer; Creep Properties; Education; Cements; Ceramics; Polyesters; Graphite

19980010878 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Synthesis of Oligomeric Anilines

Zhang, W. J., Pennsylvania Univ., USA; Feng, J., Pennsylvania Univ., USA; MacDiarmid, A. G., Pennsylvania Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 4p; In English

Contract(s)/Grant(s): N00014-92-J-1369; N00014-95-1-0302; NIST-ATP-1993-01-0149

Report No.(s): AD-A330188; TR-P302; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Parent aniline oligomers such as tetramer and '16-mer' have been synthesized by a general method. This method can be used to synthesize other oligomers by selecting appropriate ratios of reactants and appropriate oxidants. The oligomers were characterized by UV/Vis, IR, NMR, mass spectroscopy, GPC and elemental analysis. The conductivities of HCl doped oligomers were lower than that of polyaniline.

DTIC

Aniline; Infrared Spectroscopy; Mass Spectroscopy; Nuclear Magnetic Resonance; Oligomers; Synthesis (Chemistry); Spectroscopic Analysis; Electrical Resistivity

24

COMPOSITE MATERIALS

Includes physical, chemical, and mechanical properties of laminates and other composite materials. For ceramic materials see 27 Nonmetallic Materials.

19980009276 Oregon Graduate Inst. of Science and Technology, Materials Microanalysis Labs., Portland, OR USA

An Image Analysis Technique for Evaluating Internal Damage in Graphite/Polyimide Fabric Composites

Searles, K., Oregon Graduate Inst. of Science and Technology, USA; McCarthy, J., Oregon Graduate Inst. of Science and Technology, USA; Kumosa, M., Denver Univ., USA; Mar. 1997; 31p; In English

Contract(s)/Grant(s): F49620-96-I-0314; NSF CMS-96-96160

Report No.(s): AD-A329913; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this paper is to suggest a possible technique for evaluating internal damage in fabric composite material. The technique presented in this work is based on capturing and performing a qualitative analysis of scanning electron microscope (SEM) images of damage from planar specimen slices and then reassembling the slices in three dimensional space. This method has been applied to evaluate damage in graphite/PMR-15 fabric Iosipescu specimens tested in shear. Three-dimensional damage maps have been presented and the extent of damage through the thickness of a graphite/PMR-15 Iosipescu specimen has been determined. The same approach could be used for the evaluation of internal damage in other composite systems.

DTIC

Graphite-Polyimide Composites; Image Analysis; Damage

19980009278 Virginia Polytechnic Inst. and State Univ., Materials Response Group, Blacksburg, VA USA

Durability and Damage Tolerance of High Temperature Polymeric Composites Final Report

Case, Scott W., Virginia Polytechnic Inst. and State Univ., USA; Reifsnider, Kenneth L., Virginia Polytechnic Inst. and State Univ., USA; 1996; 229p; In English; Diskette: 3 3.5 inch DSHD diskettes

Contract(s)/Grant(s): NAG1-1608

Report No.(s): NASA/CR-97-205947; NAS 1.26:205947; NONP-NASA-DK-1997082330; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche; A04, Diskette

Modern durability and damage tolerance predictions for composite material systems rely on accurate estimates of the local stress and material states for each of the constituents, as well as the manner in which the constituents interact. In this work, a number of approaches to estimating the stress states and interactions are developed. First, an elasticity solution is presented for the problem of a penny-shaped crack in an N-phase composite material system opened by a prescribed normal pressure. The stress state around such a crack is then used to estimate the stress concentrations due to adjacent fiber fractures in composite materials. The resulting stress concentrations are then used to estimate the tensile strength of the composite. The predicted results are compared with experimental values. In addition, a cumulative damage model for fatigue is presented. Modifications to the model are made to include the effects of variable amplitude loading. These modifications are based upon the use of remaining strength as a damage metric and the definition of an equivalent generalized time. The model is initially validated using results from the literature. Also, experimental data from APC-2 laminates and IM7/K3B laminates are used in the model. The use of such data for notched laminates requires the use of an effective hole size, which is calculated based upon strain distribution measurements. Measured remaining strengths after fatigue loading are compared with the predicted values for specimens fatigued at room temperature and 350 F (177 C).

Author

Durability; Damage; Tolerances (Mechanics); High Temperature; Polymer Matrix Composites; Composite Materials

19980009524 Illinois Univ., Dept. of Civil Engineering, Chicago, IL USA

Fracture Characteristics of Fiber Composites Final Report, Jun. 1993 - Nov. 1996

Botsis, John, Illinois Univ., USA; Jan. 1997; 81p; In English

Report No.(s): AD-A329787; AFOSR-TR-97-0455; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Investigations of the effects of fiber spacing on the mechanical properties and strength of a model composite system with well aligned and uniformly spaced fibers are reported. Monolayer and multilayer fiber architectures were investigated. For the monolayer fiber architecture specimens, strength σ depended on the fiber spacing, λ , according to $\sigma = K/\sqrt{\lambda}$ where K is a constant related to the matrix properties. The linear portion of the stress-strain curves.

DTIC

Composite Materials; Fiber Composites; Fractures (Materials); Matrix Materials

19980009533 Wayne State Univ., Dept. of Mechanical Engineering Sciences, Detroit, MI USA

DURIP95/Ultra High Precision Diagnostic High Temperature Laboratory Final Report, 15 Aug. 1995 - 31 Jan. 1997

Newaz, Golam M., Wayne State Univ., USA; Jul. 18, 1997; 86p; In English

Contract(s)/Grant(s): F49620-95-I-0483

Report No.(s): AD-A329871; AFOSR-TR-97-0347; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The DURIP grant was used to develop an efficient high temperature laboratory with high precision instruments to make deformation and load measurements in high temperature materials including advanced composites. The laboratory has been successfully developed in Mechanical Engineering Department at Wayne State University under the direction of Professor Golam Newaz - who was the PI of the program. Based on the capability developed, the laboratory can be considered a national resource as extensive capabilities have been integrated with existing facilities in Advanced Composites Research Laboratory at Wayne State University. High temperature testing capabilities include evaluation of mechanical and thermomechanical capabilities up to 2200 F with an induction heating system that is interfaced with modern MTS 810 servohydraulic equipment. Polymeric, ceramic and metal matrix composites including superalloys with thermal barrier coatings can be tested for material properties, fatigue and fracture performance.

DTIC

Ceramics; Composite Materials; Composite Structures; Fatigue (Materials); Metal Matrix Composites; Refractory Materials; Thermal Control Coatings

19980009779 NERAC, Inc., Tolland, CT USA

Filament Winding Methods and Equipment (Latest Citations from the US Patent Bibliographic File with Exemplary Claims)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868674; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning materials, methods, and equipment used in filament winding processes. Components of winding machines are discussed, and polymer and fiber reinforced filament wound composites are described. Applications include use in pressure vessels, pipes and tubes, transformers, and sports equipment. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Filament Winding

19980009890 Boeing Defense and Space Group, Materials Processes and Physics Technology Div., Seattle, WA USA

Composite Failure Analysis Handbook Final Report

Walker, Gregory M., Boeing Defense and Space Group, USA; Aug. 1997; 264p; In English

Contract(s)/Grant(s): F33615-86-C-5071; AF Proj. 2418

Report No.(s): AD-A330037; DOT/FAA/AR-96/21; WLXC-TR-93-4004; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This report contains fractographic data from failed composite test specimens as well as case histories of failed composite structure. Fractographic data from statically loaded test specimens are presented for carbon/epoxy (AS4/3501-6), carbon/ pseudo-thermoplastic (AS4/KIII), carbon/polyimide (AS4/PMR-15), carbon/thermoplastic (AS4/PEEK), carbon/bismaleimide (AS4/MR-54-4), and carbon and glass low-temperature curing epoxy, (HTA 5131-12K/Rutapox L-20/SL and EC 9-756/K43/Rutapox L-20/SL) materials. Fractographic data are presented for translaminar and interlaminar carbon/resin laminate fatigue specimens, as well as for several failure modes in composite skin nomex honeycomb core specimens. Three failure investigations, including two composite honeycomb structures and one carbon/epoxy laminate structure, are also documented.

DTIC

Composite Structures; Failure Analysis; Handbooks; Failure Modes

19980009891 Brown Univ., Div. of Engineering, Providence, RI USA

The Micromechanics of Deformation and Failure in Metal-Matrix Composites Final Report, 14 May 1994 - 14 May 1997

Needleman, Alan, Brown Univ., USA; May 1997; 6p; In English

Contract(s)/Grant(s): F49620-94-I-0300

Report No.(s): AD-A330031; AFOSR-TR-97-0511; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Metals reinforced with ceramic fibers or particulates are promising materials for use in new generations of aerospace structures, propulsion devices and energy conversion systems. Furthermore, the controllability of many of these variables opens up the possibility of engineering materials for specific applications, if the effects of alterations in microstructure can be predicted. However, metal-matrix composites often have low ductility and low fracture toughness. An improved understanding of the basic deformation and failure mechanisms is needed to overcome these problems. To this end, research was carried out in three areas: (1) continuum modeling of deformation and fracture in metal-matrix composites, including the interaction between failure mechanisms using phenomenological constitutive relations to characterize each of the main failure modes in metal-matrix composites, reinforcement cracking, interfacial debonding and matrix void nucleation, growth and coalescence; (2) numerical studies of the propagation of fast cracks along and across interfaces, with a particular focus on understanding crack propagation from a brittle phase into a ductile phase; and (3) discrete dislocation modeling of matrix plastic deformation in metal-matrix composites with micron size reinforcements.

DTIC

Metal Matrix Composites; Micromechanics; Failure Modes; Continuum Modeling; Crack Propagation; Deformation

19980009982 NERAC, Inc., Tolland, CT USA

Design and Properties of Joints in Composites: Latest Citations from Engineered Materials Abstracts

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863535; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design of joints for composite materials and their resulting mechanical properties. References cover bending, buckling, compression, creep, deformation, elasticity, fatigue, fracture, impact, and shear properties. Adhesive, bolted, flanged, lap, riveted, scarf, and welded joints are discussed. Ceramic, metal, and plastic composites are covered.

NTIS

Composite Materials; Bibliographies; Design Analysis; Ceramics; Joints (Junctions)

19980010042 Stanford Univ., Dept. of Aeronautics and Astronautics, Stanford, CA USA

On-Line Impact Identification of Composite Structures Using Built-In Piezoelectrics *Final Report, 15 Jan. 1994 - 14 Jan. 1997*

Chang, Fu-Kuo, Stanford Univ., USA; Tracy, Michael J., Stanford Univ., USA; Jun. 18, 1997; 108p; In English

Contract(s)/Grant(s): F49620-94-I-0116

Report No.(s): AD-A329708; AFOSR-97-0368TR; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A method is introduced to identify an unknown impact on a composite plate. The identification includes the impact location and force time history. A distributed piezoelectric sensor array measures the plate response to the impact. An optimization technique solves the identification problem. The technique identifies the impact by comparing the calculated model response to the measured response. The identification method was implemented in the computer code IDIMPACT. To verify the identification system, many impacts were distributed on a 36-inch by 30-inch composite plate with a distributed surface-mounted piezoelectric sensors. The code proved to be a reliable and accurate identification system. The average error in the reported impact was .56 inch, and the average error in the energy of the force reconstruction was 15%.

DTIC

Composite Structures; Computer Programs; Piezoelectricity; Plates (Structural Members)

19980010545 Japan Atomic Energy Research Inst., Dept. of Materials Science and Engineering, Tokyo, Japan

Thermal conductivity of neutron-irradiated uni-directional carbon fiber reinforced carbon material

Saito, Tamotsu, Japan Atomic Energy Research Inst., Japan; Deng, Kai, Nuclear Power Inst. of China, China; Nakano, Junichi, Japan Atomic Energy Research Inst., Japan; Yamada, Reiji, Japan Atomic Energy Research Inst., Japan; Jan. 1997; 26p; In Japanese

Report No.(s): JAERI-Research-97-001; DE97-745397; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A uni-directional carbon-carbon composite material, MFC-1, was irradiated with fission neutrons at a temperature near 1070 K to a fluence of 0.7 dpa., and a degradation of thermal conductivity was measured by a laser flash method. The reduction of conductivity due to the irradiation showed a dependence on measurement temperature: at room temperature the conductivity decreased to 20 % of the unirradiated value and became to 45 % at 900 K. About 60 % of the radiation-induced thermal resistance was recovered by a post-irradiation annealing at 1600 K for 0.5 h. The thermal resistance increased linearly with the measurement temperature over 600 K, and the irradiation-induced resistance showed little temperature dependence. The thermal resistance of MFC-1 was analyzed in terms of phonon mean free paths: Umklapp processes, crystallite boundary and irradiation-induced defect scattering. This result showed that the temperature dependence of thermal resistance was mainly due to Umklapp processes, although a little temperature dependence was observed for the mean free path of defect scattering. The anisotropy of MFC-1 was also discussed with the crystallite orientation parameter obtained from the conductivity values both parallel and vertical to the fiber bundle direction.

DOE

Thermal Conductivity; Neutrons; Irradiation; Carbon-Carbon Composites; Carbon Fibers; Radiation Effects; Graphite

19980010558 NERAC, Inc., Tolland, CT USA

Automation in Processing Composites: Forming. (Latest Citations from Engineered Materials Abstracts)

Feb. 1996; In English

Report No.(s): PB96-863121; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning automated forming techniques used in composite materials processing. Citations discuss automated diaphragm forming, thermoforming, and deep-drawing of composite structures. The use of robots to lay tow, tape, and fiber are included. Automated preforming, pultrusion and lay-up are also discussed. Automation in the molding of composite materials and in the testing and quality control of composite materials is covered in separate bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Composite Structures; Forming Techniques

19980010833 Arizona State Univ., Dept. of Mechanical and Aerospace Engineering, Tempe, AZ USA

The Mechanism of Energy Absorption via Sensitivity Analysis for Crashworthy Design of Composite Structures *Final Report, 1 Jan. 1993 - 31 Jul. 1997*

Chattopadhyay, Aditi, Arizona State Univ., USA; Gu, Haozhong, Arizona State Univ., USA; Guo, Ruijiang, Arizona State Univ., USA; Seeley, Charles E., Arizona State Univ., USA; Oct. 15, 1997; 8p; In English

Contract(s)/Grant(s): DAAH04-93-G-0043

Report No.(s): AD-A332154; ARO-30729.14-EG; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The objectives of the current research are accurate analysis of composite structures under compressive loading and development of efficient analytical sensitivity analysis procedure for application to crashworthy design of composites. A new higher order theory has been developed to study the delamination buckling, postbuckling and growth problem in composite plates and shells. Experimental investigation was performed on delamination buckling and postbuckling of composites with built-in delaminations to evaluate critical load and postbuckling characteristics. The result is a comprehensive data base. Elasticity approach, which accurately models transverse shear and transverse normal deformation, has also been developed. The experimental data base and the elasticity solutions have been used to validate the developed new higher order theory. The research provides a comprehensive investigation on modeling of delaminated composites and an accurate evaluation of limitations of the classical laminate and other improved shear deformation theories. An analytical design sensitivity procedure and a hybrid optimization technique have also been developed for application to improved energy absorption in composites. The procedure is computationally efficient. The hybrid optimization technique allows the simultaneous inclusion of continuous and discrete design variables and is applicable to a wide variety of design problems. The procedure has been used to maximize the energy absorption of composite plates subject to compressive loading and shows significant improvements.

DTIC

Composite Structures; Energy Absorption; Sensitivity; Crashworthiness; Compression Loads

19980011625 Georgia Inst. of Tech., Atlanta, GA USA

Nonlinear Aeroelastic Effects in Damaged Composite Aerospace Structures *Final Report, 1 Apr. 1995 - 31 Mar. 1997*

BAuchau, O. A., Georgia Inst. of Tech., USA; Loewy, R. G., Georgia Inst. of Tech., USA; Oct. 27, 1997; 40p; In English

Contract(s)/Grant(s): F49620-95-I-0241

Report No.(s): AD-A332139; AFOSR-97-0683TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Matrix micro-cracking affects the stiffness properties of composite laminates and the corresponding sectional stiffnesses, most prominently laminates exhibiting elastic coupling. Matrix micro-cracking gives rise to nonlinear materials behavior in the presence of nonuniformly distributed crack densities. Such matrix damage appears to have little effect on basic bending-torsion flutter speed. However, this damage can induce a limit cycle behavior at airspeeds somewhat below the flutter speed. The effect of damage on the aeroelastic behavior of wing-aileron systems is found to be more pronounced. Here again flutter speeds were found to be slightly lower in the presence of damage. However, in this case, a limit cycle behavior was observed for a significant range of airspeeds below the flutter speed. Reduced fatigue life could result from this limit cycle behavior, since much higher cyclic stresses are generated thereby in the wing-aileron structure.

DTIC

Aeroelasticity; Composite Structures; Microcracks; Aircraft Structures

19980011647 MATSYS, Inc., Springfield, VA USA

Development of Intelligent Processing Methodology for Intermetallic Matrix Composites *Progress Report*

Nov. 04, 1997; 9p; In English

Contract(s)/Grant(s): N00014-96-C-0427

Report No.(s): AD-A331470; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The project aims at development of processing technologies for a broad, new family of in-situ metal matrix composites based upon the innovative use of multi-lithic reinforcement strategies. Intermetallic matrix composites (IMCs), reinforced with a dispersed ceramic phase, will be incorporated into metallic matrices to serve as reinforcing entities within the resulting Multi-lithic Reinforced Composite (MRC). IMC-reinforcement in metallic matrices is particularly novel since they can be created to possess low temperature strengths normally unique to structural ceramics, and retain a metallic-like ability to be deformed at high temperatures. When combined with creative processing methodologies, such composites will offer an unprecedented degree of micro-structural and property design capability. When specifically applied to light-metal matrices, the composites will possess the normally elusive combination of high specific strength, thermomechanical stability, economy of processing, and increased use-temperature capability. While the concept of an IMC-reinforced metal matrix composite can be broadly extended to a wide range of conceivable processing methodologies and composite geometries, deformation processing techniques has been selected for this

effort as the approach whereby the best properties of both the IMC and matrix components can be most efficiently and synergistically applied. For example, through the imposition of high temperature, powder-based extrusion, an aligned MRC can be created if the metal matrix and the IMC-reinforcement deform commensurably. The specific objectives of this study are to: Identify most significant MRC material system(s) for advanced navy propulsion systems.

DTIC

Metal Matrix Composites; Technology Assessment; Intermetallics

19980011671 Michigan Univ., Dept. of Aerospace Engineering, Ann Arbor, MI USA

Development of Failure Criteria for Polymer Based Composites under Multi-axial Loading Final Report, 1 Aug. 1995 - 31 Jul. 1996

Waas, Anthony M., Michigan Univ., USA; Jan. 20, 1997; 9p; In English

Contract(s)/Grant(s): F49620-95-I-0464

Report No.(s): AD-A332883; AFOSR-97-0707TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Specifically, we have purchased an axial torsional MTS loading frame and accessories to complement an already existing in-house built planar multi-axial load frame. The research that the instrumentation will facilitate has three phases. In phase 1, test coupons (polymer based fibrous laminated composites) that have a cruciform shape and containing a centrally located circular cutout are placed under remotely applied planar, biaxial tension (compression) proportional load states. Biaxial failure envelopes are generated as well as an identification of specific failure mechanisms and measurements such as critical strains to failure. In phase two, the specimens are loaded statically as well as under different loading rates to levels that are fraction of the failure loads and unloaded at different loading rates, thereby characterizing the strain rate dependency and assessing a measure of damage accumulation. In phase three, the polymer (matrix material), by itself is characterized using specimens that are cylindrical under combined tension/compression and axial loading. These tests are to be performed under different temperatures and for a given temperature under different loading rates. The experiments will enable the development of analytical models with a micromechanics basis and importantly, the identification of the operative failure mechanism under different mechanical loads and in the presence of different environmental conditions.

DTIC

Axial Loads; Compression Loads; Cylindrical Bodies; Fiber Composites; Laminates; Mathematical Models; Matrix Materials; Micromechanics

19980011880 Dayton Univ. Research Inst., OH USA

The Evaluation of Thermally Induced Damage in Polymer Matrix Composites via a Design of Experiments Approach Final Report, 1 Jul. 1992 - Jul. 1992

Kistner, Mark D., Dayton Univ. Research Inst., USA; Kuhbander, Ronald J., Dayton Univ. Research Inst., USA; Mccray, Daniel B., Dayton Univ. Research Inst., USA; Jan. 1997; 58p; In English

Contract(s)/Grant(s): F33615-95-D-5616; AF Proj. 4349

Report No.(s): AD-A330688; WL-TR-97-4017; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

As of the date of this report overhear damage is an area of concern for the supportability of polymeric matrix composites, since a significant amount of strength is lost, up to 30% in shear, before this a damage is detectable by standard ultrasonic inspections techniques. This report takes the approach of using a design of experiments to determine which factors and interactions significantly affect the heat damage behavior of polymeric matrix composites. A 64-run design was developed which could rank all the identified factors and interaction. A quartz lamp bank is used to provide one-sided radiant heating. Mechanical testing includes four-point shear, and 24:1 four point flexure. The factors were analyzed and ranked for both test methods. Also, the data was entered two different ways (1) as five replicates of the same exposure conditions, and (2) as average values. The data entered as replicates showed many more of the factors and interactions to be significant than when the data was entered as averages. The work has identified the significant factors and two-level interactions affecting the heat damage behavior of polymeric matrix composites. Follow-on efforts should be orientated at identification of heat damage failure mechanisms and nondestructive methods to detect these identified mechanisms.

DTIC

Damage Assessment; Composite Materials; Matrix Materials; Evaluation; Polymer Matrix Composites; Damage; Experiment Design; Thermodynamic Properties

INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry. For related information see also 77 Thermodynamics and Statistical Physics.

19980009146 NERAC, Inc., Tolland, CT USA

Bulk Traps: Effects, Characteristics and Analysis. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865480; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the influence and treatment of bulk traps in components and equipment. Citations focus on measurement methods, performance degradation, effects of material modification, and theoretical analysis. Topics cover Deep Level Transient Spectroscopy (DLTS), bulk Generation LifeTime (GLT), Surface Recombination Velocity (SRV), and Negative PhotoConductivity (NPC). Components discussed include GaAs MESFETs, metal-insulator- semiconductor devices, charge-coupled devices, and high electron mobility transistors.

NTIS

Bibliographies; Mathematical Models; Traps; Holes (Electron Deficiencies)

19980009233 NERAC, Inc., Tolland, CT USA

Electrophoresis: Technology and Applications. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866447; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning techniques and effective use of electrophoresis. Citations focus on image processing and interpretation, zero gravity conditions, reptation models, drift velocity, boundary effects, theory, and algorithms. Topics cover analysis of charged polymers, DNA, colloidal spheres, and techniques such as capillary (CE), alkaline microgel, and Pulsed Field Gel (PFGE) electrophoresis. Instrumentation discussed includes high sensitivity radiation detection, Raman spectroscopic detection, field inversion apparatus, and charge coupled cameras.

NTIS

Bibliographies; Electrophoresis; Technologies; Image Processing; Boundaries; Gels; Charge Coupled Devices

19980009323 Argonne National Lab., IL USA

Redox behavior of europium in the Preyssler heteropolyanion [EuP5W30O110](12-)

Antonio, M. R., Argonne National Lab., USA; Soderholm, L., Argonne National Lab., USA; [1997]; 10p; In English

Contract(s)/Grant(s): W-31109-eng-38

Report No.(s): ANL/CHM/PP-88535; DE97-008271; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

In aqueous, mineral-acid electrolytes, the cyclic voltammetry of the europium-exchanged Preyssler heteropolyanion, [Eu(sup III)P5W30O110](sup 12-), is unique among all the other trivalent-lanthanide-exchanged anions, [Ln(sup III)P5W30O110](sup 12-) for Ln (triple bond) Ce-Lu. All [LnP5W30O110](sup 12-), including Eu, form heteropoly blues upon reduction. In order to obtain insights about this issue, we conducted in situ Eu L3-edge XANES (X-ray absorption near edge structure) spectroelectrochemical experiments on an aqueous solution of [EuP5W30O110](sup 12-) (5.5 mM) in a supporting electrolyte of 1 M H2SO4 at two extreme potentials. The results demonstrate that the Eu(sup III) ion in the colorless Preyssler anion solution at open circuit potential (+0.21 V vs Ag/AgCl) is electroactive and is reduced to Eu(sup II) in the resulting dark blue solution from constant-potential bulk electrolysis at -0.55 V vs Ag/AgCl. This unusual redox behavior of [EuP5W30O110](sup 12-) may be of technological importance in the area of oxidation catalysis.

DOE

Europium; Europium Compounds; Phosphorus Compounds; Tungstates; Valence

19980009345 NERAC, Inc., Tolland, CT USA

Chemiluminescence: Measuring Methods (Latest Citations from the NTIS Bibliographic Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869540; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning chemiluminescence assays. The citations include sample system design, sample collection, measurement techniques, and sensitivity of the instrumentation. Applications in high altitude air pollution studies are emphasized. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Chemiluminescence; Bibliographies

19980009417 Erlangen-Nuerenberg Univ., Inst. for Theoretical Chemistry, Erlangen, Germany

Quantum Mechanical Investigation of Polymeric Properties Using a Combination of First Principle Quantum Chemical and Solid State Physical Methods *Final Report, 1 Jul. 1996 - 30 Jun. 1997*

Ladik, Janos, Erlangen-Nuerenberg Univ., Germany; Jul. 20, 1993; 18p; In English

Contract(s)/Grant(s): F49620-92-J-0253; AF Proj. 2419

Report No.(s): AD-A330603; TR-2; AFOSR-TR-97-0539; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Hartree-Fock (HF) crystal orbital code as well as its correction for correlation has been rewritten in FORTRAN 90 in a vectorized form. This language has several advantages. We have performed also a multipole expansion for the not explicitly calculated Coulomb integrals and introduced different thresholds for different types of integrals. The new program packages will be completely ready and tested in about two months. A copy of them will be sent to the Air Force Office of Scientific Research as well as to Dr. Doug Dudis at Wright-Patterson Air Force Base. Using our present HF and QP band structure programs we have calculated polyparaphenylene-vinylidene and the four nucleotide base stacks. We have started to compute also different homopolypeptides. The results in the first case show that to obtain a good agreement between the calculated gap (4.87 eV) and the one estimated from experimental data, one has to perform a 2D calculation. In the case of the cytosine (C) stack we have improved our double basis by inserting at the half stacking distance a virtual C molecule. The calculated gap value of 6.60 eV is close to the value estimated from the exciton spectra of C (5.5 eV). On the basis of this also the gaps of the other base stacks could be improved. Finally we have already calculated the QP band structures of polyserine and polythreonine. The obtained gap values are by about 4 eV smaller than the corresponding HF ones.

DTIC

Crystals; Estimating; Excitons; FORTRAN; Hartree Approximation; Mechanical Properties

19980009505 Argonne National Lab., IL USA

Interpreting X-ray and auger resonant Raman spectra

Lebrun, T., Argonne National Lab., USA; 1996; 15p; In English; Raman Emission by X-rays (Rex-1) Workshop, 8-9 Dec. 1996, New Orleans, LA, USA

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): ANL/PHY/CP-89722; CONF-961261-1; DE97-003877; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

We discuss resonant Raman Scattering in atoms within the context of conservation of energy, arguing that energy conservation determines the principal features of spectra taken at a resolution comparable to the natural widths of the transitions involved. Example systems applicable to atoms or solids are calculated using the model by Tulkki and Aberg, and the model is discussed in terms of energy conservation. Finally, results for X-ray resonant Raman scattering in Xe and Auger resonant Raman scattering in Ar are presented and the two processes are contrasted.

DOE

Photoionization; Resonance Scattering; Raman Spectra; Energy Conservation; Auger Spectroscopy; X Ray Scattering

19980009512 Sandia National Labs., Livermore, CA USA

SPCDC: A Pulse Combustor Design Code *Final Report, Nov. 1993 - Jan. 1996*

Barr, P. K., Sandia National Labs., USA; Keller, J. O., Sandia National Labs., USA; Mar. 1996; 126p; In English

Contract(s)/Grant(s): GRI-5091-246-2334

Report No.(s): PB97-189823; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A user-friendly, PC-executable computer code has been developed that can assist engineers in designing pulse combustors for specific applications and in refining existing units. This code represents the culmination of over 10 years of research and development in the field of pulse combustion. The Sandia Pulse Combustor Design Code, or SPCDC, couples both the fuel-air injection and the energy release to the time-varying pressure wave. Because the injection and combustion processes both drive and are driven by the wave dynamics, this model couples the major processes that occur in a pulse combustor. SPCDC can supplement the time-proven method of actually building and testing a prototype unit, and significantly reduce the number of units that must

be tested. It will help produce a superior pulse combustion system tailored to a specific application and should help widen the range of successful applications.

NTIS

Combustion Chambers; Combustion Physics; Elastic Waves; Fluid Dynamics; Pulse Compression

19980009529 Yale Univ., High Temperature Chemical Reaction Engineering Lab., New Haven, CT USA

Transport and Interfacial Kinetics in Multiphase Combustion Systems *Final Report, 15 Feb. 1994 - 14 Feb. 1997*

Rosner, Daniel E., Yale Univ., USA; Feb. 1997; 38p; In English

Contract(s)/Grant(s): F49620-94-I-0143; AF Proj. 2308

Report No.(s): AD-A330480; AFOSR-TR-97-0523; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A 3-year program of research oriented toward the formation/transport of combustion-generated particles is summarized. Using thermophoretic sampling/TEM image analysis techniques, both inorganic (alumina) and carbonaceous soot aggregates have been shown to exhibit quantitatively similar morphologies. A thermophoresis-based method for measuring absolute local soot volume fractions, f_v , in flames has been successfully implemented (in both co-flow and counterflow laminar diffusion flames). Called Thermocouple Particle Densitometry (TPD), it exploits the laws governing thermocouple response to the thermophoretic soot deposition, as first suggested by Eisner and Rosner in 1985. This method is independent of (often unknown) soot optical properties, unbiased with respect to soot morphology and size distribution, and yields spatially resolved f_v values directly even at low soot concentrations (below 0.1 ppm). Accordingly, while neither "instantaneous" or "non-intrusive", it is especially applicable to spatially non-uniform and/or lightly sooting laminar steady flames. Ancillary studies of the transport properties of soot aggregates, and particle impaction on cylinders in high-speed crossflow are also described/documentated among the 30 cited references emerging from this program(Section 5).

DTIC

Aluminum Oxides; Combustion; Combustion Chemistry; Counterflow; Cross Flow; Density Measurement; Deposition; Diffusion Flames; Image Analysis; Laminar Flow; Low Concentrations

19980009624 Baltic State Technical Univ., Saint Petersburg, Russia

Intra-Chamber Processes, Combustion and Gas Dynamics of Dispersed Systems, Second International Seminar

Aug. 1997; 120p; In English

Report No.(s): AD-A332394; EOARD-CSP-97-1018; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Topics covered include: Interior ballistics; heat and mass transfer, heat protection of channels; combustion of metal droplets in active media; spray combustion and two-phase flows.

DTIC

Conferences; Interior Ballistics; Mass Transfer; Heat Transfer; Metal Combustion; Two Phase Flow

19980009646 National Inst. for Occupational Safety and Health, Cincinnati, OH USA

Computational Formulas for Total Relative Standard Deviations of Combined Gravimetric-Analytic Determinations

Shulman, S. A., National Inst. for Occupational Safety and Health, USA; Jun. 1997; 42p; In English

Report No.(s): PB97-197073; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report considered the sources of variability in each of several determinations at the limits of quantitation of the aerosol gravimetric procedure. In an analytical gravimetric procedure, the difference between the presampling and postsampling weight of a filter is used to determine the mass of aerosol collected. The primary question is if the weight of the sample collected corresponds to the limit of quantitation of the gravimetric determination, then what is the magnitude of error for subsequent determinations, for example, of extractables. Using available data, the relative standard deviations for the determinations of the different components of the measurement processes are determined. These values can then be used in the formulas presented here to calculate the total relative standard deviations of the determinations, which can then be compared to target relative standard deviations, such as the assessment of accuracy. The authors present applications for collecting total aerosol on filters, followed by the analysis for solvent extractable material and polycyclic aromatic hydrocarbons.

NTIS

Gravimetry; Standard Deviation; Accuracy; Chemical Analysis; Analytical Chemistry; Air Filters; Aerosols

19980009754 Sandia National Labs., Albuquerque, NM USA

Copper in silicon: Quantitative analysis of internal and proximity gettering

McHugo, S. A., California Univ., Lawrence Berkeley Lab., USA; Flink, C., California Univ., USA; Weber, E. R., California Univ.,

USA; 1997; 7p; In English; 19th; International Conference on Defects In Semiconductors, 21-25 Jul. 1997, Aveiro, Portugal
Contract(s)/Grant(s): DE-AC04-94AL-85000
Report No.(s): SAND-97-1884C; CONF-970788-1; DE97-007952; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The behavior of copper in the presence of a proximity gettering mechanism and a standard internal gettering mechanism in silicon was studied. He implantation-induced cavities in the near surface region were used as a proximity gettering mechanism and oxygen precipitates in the bulk of the material provided internal gettering sites. Moderate levels of copper contamination were introduced by ion implantation such that the copper was not supersaturated during the anneals, thus providing realistic copper contamination/gettering conditions. Copper concentrations at cavities and internal gettering sites were quantitatively measured after the annealings. In this manner, the gettering effectiveness of cavities was measured when in direct competition with internal gettering sites. The cavities were found to be the dominant gettering mechanism with only a small amount of copper gettered at the internal gettering sites. These results reveal the benefits of a segregation-type gettering mechanism for typical contamination conditions.

DOE

Annealing; Implantation; Ion Implantation; Oxygen; Precipitates; Quantitative Analysis; Silicon

19980009785 Technische Univ., Eindhoven, Netherlands

Mass Burning Rate of Stretched Flames with Multi-Component Transport and Chemistry

de Goey, L. P. H., Technische Univ., Netherlands; ten Thije Boonkkamp, J. H. M., Technische Univ., Netherlands; Dec. 1996; 24p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-204945; RANA-96-23; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The mass burning rate of stretched flames with multi-species transport and chemistry is computed from the quasi-1D flamelet equations for mass species, mass fractions, enthalpy and element mass fractions. These flamelet equations, which are derived from the basic conservation equations, describe transport perpendicular to a flame surface and contain source terms proportional to the local stretch rate. An analytical expression for the mass burning rate is derived, containing the local stretch rate and the changes in enthalpy and stoichiometry due to preferential diffusion. The expression for the mass burning rate is further elaborated for flames with constant stretch rate. As a special case, a lean methane/air flame is studied. Finally, the theory is applied to the tip of a stationary Bunsen flame.

NTIS

Flames; Burning Rate; Stoichiometry; Methane; Diffusion

19980009850 Florida Univ., Gainesville, FL USA

Polymeric Electrolytes via Silicon: Chlorine Nucleophilic Substitution Chemistry Final Report, Sep. 1996 - Sep. 1997

Wagener, K. B., Florida Univ., USA; Reynolds, J. R., Florida Univ., USA; Brzezinska, K. R., Florida Univ., USA; Sep. 26, 1997; 7p; In English

Contract(s)/Grant(s): DAAH04-96-I-0454

Report No.(s): AD-A332459; ARO-36337.1-CH; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The project goals are the synthesis of new materials having the potential for use as ion-conducting membranes. We have been able to make rugged membrane structures from a polymer of interest by first casting the polymer on a surface then exposing it to UV irradiation. These procedure generates free standing membranes that are quite durable in themselves. The initial goal has been to investigate the use of unsaturated carbosilane monomer functionalized with an Si-Cl bond in the synthesis of new materials for use as ion-conducting membranes. We have spent most of our time devising the synthesis chemistry needed to create chlorosilane monomers substituted with appropriate nucleophiles. The nucleophiles employed thus far have been diethylene glycol methyl ether and the sodium salt of 3-hydroxy-1-propane-sulfonic acid.

DTIC

Nucleophiles; Synthesis (Chemistry); Polymer Chemistry; Membrane Structures; Electrolytes; Metathesis; Chlorosilanes

19980009907 Louisiana Tech Univ., Ruston, LA USA

Thermal Analysis of an X-ray Irradiated Resist-Substrate Wafer

Rogers, James, Louisiana Tech Univ., USA; Ameal, Timothy A., Louisiana Tech Univ., USA; Sep. 14, 1997; 99p; In English
Contract(s)/Grant(s): DAAH04-94-G-0348

Report No.(s): AD-A329869; ARO-33844.1-PH-DPS; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

LIGA is a relatively new technology used to pattern High Aspect Ratio MicroElectroMechanical Systems (HARMEMS) in a resist material, using X-ray radiation. Resist materials used in LIGA typically have conduction and thermal expansion properties

that are very different from those of the substrate that supports them during the exposure process, and thermal deformations may limit the ability of the LIGA process to reproduce patterns accurately in the resist. A knowledge of the temperature distributions in the resist and substrate will facilitate the study of thermal deformations and their effects on the manufacturing process. The solution of analytical models of the temperature distributions in the resist-substrate system are presented. The primary models presented are a one-layer, two-dimensional model, and a two-layer model in one dimension. Boundary conditions are developed based on current practices used in the LIGA process. Subjects relating to the evaluation of the solutions are discussed, including the characteristics of series solutions and the development of computer programs to handle calculations. The results of some simple temperature measurement experiments performed at the Center for Advanced Microstructures and Devices (CAMD) are presented, along with a discussion of the relative merits of experimental, computational, and analytical methods of analysis.

DTIC

Thermal Analysis; X Rays; Electromechanical Devices; Substrates; Wafers; Electron Radiation

19980010113 Columbia Univ., Dept. of Chemistry, New York, NY USA

A Novel Photochemical Interfacial Approach to the Degradation of Hazardous Materials *Final Report, 1 Jun. 1993 - 31 May 1997*

Turro, Nicholas J., Columbia Univ., USA; Jul. 01, 1997; 5p; In English

Contract(s)/Grant(s): F49620-93-I-0292; AF Proj. 3484

Report No.(s): AD-A329694; AFOSR-97-0442TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Two studies are described. The first involved the use of time resolved electron spin resonance as a mechanistic and spectroscopic probe of two fundamental reactions of ketone photochemistry: intermolecular hydrogen abstraction by the triplet state of benzophenone and triplet state alpha-cleavage of 1,3-diphenylacetone (dibenzyl ketone). It was found that the forces restricting the ground state conformations of these ketones also restrict the triplet state conformations. The second study used steady-state spectroscopies and laser flash photolysis techniques to define the mechanism involved in biologically and medically related compounds employed as anticancer agents and a compound called A2-E, a bis-retinoid found in ocular cells, believed to be associated with age-related macular degeneration.

DTIC

Hazardous Materials; Electron Paramagnetic Resonance; Ketones

19980010186 Johns Hopkins Univ., Chemical Propulsion Information Agency, Columbia, MD USA

Environmentally Benign Cleaning and Degreasing Methods for the Solid Rocket Motor Industry

Cocchiaro, James E., Johns Hopkins Univ., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 13-19; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

In response to impending environmental regulations on ozone-depleting chlorinated solvents and hazardous air pollutant emissions from other solvents, the propulsion industry is faced with the challenge to implement new environmentally acceptable solvents for use in manufacturing, maintenance, and other processing operations. Hardware cleaning and coating operations in particular, such as motor case and component degreasing, need to be addressed. While all industries face similar challenges, unique concerns such as case-insulation-propellant bonding characteristics in solid rocket motors and explosives safety issues regarding solvent/energetic material compatibility make transition to alternative processes more problematic in many respects for the propulsion industry. Considerable effort is being devoted to solving these problems. This paper briefly summarizes achievements by the solid rocket industry to identify alternative cleaning processes for flight hardware.

Author

Solid Propellant Rocket Engines; Manufacturing; Solvents; Chemical Cleaning; Environment Effects; Cleaners; Alternatives; Contaminants; Chlorine Compounds; Hydrocarbons

19980010221 NASA Marshall Space Flight Center, Huntsville, AL USA

Use of Variable Angle Spectroscopic Ellipsometry in Order to Determine Contaminant Optical Properties

Hughes, C., Alabama Univ., USA; Workman, G., Alabama Univ., USA; Reynolds, J., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 329-334; In English; Also announced as 19980010184 Contract(s)/Grant(s): NAG8-1071; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

In order to measure contaminant levels found in the manufacture of the Redesigned Solid Rocket Motor (RSRM), optical properties of the contaminants are needed to develop standards for calibration purposes. Specific to our efforts is the determination of the complex index of refraction for a hydrocarbon mixture and a commercial methyl siloxane. Using ellipsometric measurements with multiple angles of incident and a range of wavelengths in the near infrared a determination of the index of refraction and the extinction coefficient

were made for the contaminants. This paper will present the optical techniques and modeling approach used to determine these optical constants of the hydrocarbon mixture and the methyl siloxane studied.

Author

Solid Propellant Rocket Engines; Contaminants; Optical Properties; Ellipsometry; Hydrocarbons; Methyl Compounds; Siloxanes; Calibrating

19980010225 Meseran Co., Chattanooga, TN USA

Rapid, Quantitative Measurement of the Level of Crosslink Density Based on a Variation of the Solvent Swell Principle

Benkovich, Mark G., Meseran Co., USA; Anderson, John Lynde, Meseran Co., USA; Russell, Ross F., Meseran Co., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 373-383; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The three minute, analytical method known as Evaporative Rate Analysis (ERA) permits rapid, microcomputer-based measurement of the level of crosslink density in polymers based on a variation of the classic solvent swell method. The ERA method involves deposition of 18 microliters of a factory preformulated test solution (a low boiling, nonradioactive solvent or solvent combination containing a high-boiling-but-volatile Carbon-14 labeled material in a ratio of ca 60,000/1 - solvent/radiochemical) onto a polymer surface. With a GM detector positioned directly above the surface and with metered air flowing between the surface and the detector, the tendency of the polymer surface to retain the radiochemical is monitored. The air sweeps the already evaporated, vapor phase solvent and the radioactive molecules out from under the detector. Following the initial evaporation of the lower boiling solvent, the rate at which the radiochemical evaporates is a function of the level of crosslink density--the more rapid the rate, the higher the level of crosslink and vice versa. The particular solvent/radiochemical formulation employed in the method is based on tests of a representative four stage cure ladder--low cure, low specification, high specification, and overcure. The method provides unique information particularly with respect to slight undercure and slight overcure conditions. The Montreal Protocol deadline has materially altered the composition of many solvent combinations since the solvency characteristics of trifluorotrichloroethane had earlier been used extensively. Current formulations based on cyclopentane, 2,3- dimethylbutane, and 2,2-dimethylbutane with varying percentages of chloroform, methylene chloride, or tetrahydrofuran as the low boiling solvent or solvent combinations have been shown generally to be superior substitutes for test solution formulations. One of two USNRC license EXEMPT C-14 radiochemicals are routinely used in the several test solution formulations, namely: Tetrabromoethane-C14 and Tridecane-C14.

Author

Crosslinking; Quantitative Analysis; Evaporation; Solvents; Density (Mass/Volume); Polymers; Surface Properties; Environment Effects; Deposition; Swelling

19980010233 BDM Corp., Engineering Services Co., Huntsville, AL USA

Low-Cost, Heavy-Metal-Bearing Wastewater Pollution Prevention Treatment: Demonstration of a Sodium Sulfide/Ferrous Sulfate-Based Batch Treatment System for the USAF

Johnson, Larry W., BDM Corp., USA; Lynn, Bert, Mississippi State Univ., USA; Smith, Ray, Armstrong Lab., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 461-468; In English; Also announced as 19980010184 Contract(s)/Grant(s): F08635-93-C-0020; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

As a part of its ongoing preventive and restorative maintenance program, the U.S. Air Force operates worldwide Corrosion Control Facilities to control the effects of environmental corrosion on its fleet of air and ground vehicles. The corrosion control implementation program employs industrial processes of abrasive and chemical paint removal; mechanical and chemical surface preparation; corrosion removal and metal treatment; protective coating application; and light metal plating. These operations typically generate considerable quantities of largely aqueous, yet hazardous, heavymetal-bearing wastes that must be controlled and prevented from entering the environment. Heavy-metal constituents of this waste stream typically include cadmium, chromium (hexavalent and trivalent), lead, and zinc that are routinely used to prevent exposed metal corrosion and structural integrity degradation. In a project sponsored by the USAF Armstrong Laboratory, a consortia of academic and industry representatives refined and demonstrated a low-cost sodium sulfide/ferrous sulfate-based chemical batch-treatment process. In this chemical process, undesired heavy-metal ions are precipitated from the aqueous stream as insoluble sulfide salts or hydroxides. An experimental batch-processing station employing this process was successfully demonstrated to treat metals bearing wastewater generated by the Corrosion Control Facility at Columbus AFB, Mississippi. Using readily available, low-cost commercial components and simple procedures, this process has been shown to effectively and rapidly reduce the heavymetal contents of the waste stream below acceptable EPA safe release levels. Within 24 hours, wastewater can be safely discharged into sanitary sewer facilities, and the resultant concentrated metals-bearing sludge (approximately 5 gallons per 1,000 gallons of treated water) can be subsequently

packaged for disposal or reclamation. This process and prototype system have the potential for wide application in low-volume heavy-metals wastewater treatment (on the order of 10,000 gallons per month) that may be encountered at various aerospace propulsion production and corrosion control facilities. This paper, covering the topic areas of technologies for waste management and mitigation, pollution prevention, and paint stripping, describes the chemical process, provides the results of the experimental testing, and details a prototype design for a full-scale localized treatment facility.

Author

Hazardous Wastes; Chemical Reactions; Pollution Control; Paint Removal; Protective Coatings; Corrosion Prevention; Metal Ions; Sodium Sulfates; Waste Management; Ferrous Metals

19980010235 Alabama Univ., Huntsville, AL USA

Study of SRM Critical Surfaces Using Near Infrared Optical Fiber Spectrometry

Workman, G. L., Alabama Univ., USA; Hughes, C., Alabama Univ., USA; Arendale, W. A., Alabama Univ., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 477-485; In English; Also announced as 19980010184

Contract(s)/Grant(s): NAS8-38609; CT-3MR029; NAG8-1071; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The measurement and control of cleanliness for critical surfaces during manufacturing and in service operations provides a unique challenge in the current thrust for environmentally benign processes. of particular interest has been work performed in maintaining quality in the production of bondline surfaces in propulsion systems and the identification of possible contaminants which are detrimental to the integrity of the bondline. This work requires an in-depth study of the possible sources of contamination, methodologies to identify contaminants, discrimination between contaminants and chemical species caused by environment, and the effect of particular contaminants on the bondline integrity of the critical surfaces. This paper will provide an introduction to the use of Near Infrared (NIR) optical fiber spectrometry in a nondestructive measurement system for process monitoring and how it can be used to help clarify issues concerning surface chemistry. In a previous conference, experimental results for quantitative measurement of silicone and Conoco HD2 greases, and tape residues on solid rocket motor surfaces were presented. This paper will present data for metal hydroxides and discuss the use of the integrating sphere to minimize the effects of physical properties of the surfaces (such as surface roughness) on the results obtained from the chemometric methods used for quantitative analysis.

Author

Infrared Spectroscopy; Near Infrared Radiation; Cleanliness; Surface Reactions; Measuring Instruments; Spectroscopic Analysis; Contamination; Hydroxides; Bonded Joints; Surface Properties

19980010236 Surface Optics Corp., San Diego, CA USA

Development and Operation of a Material Identification and Discrimination Imaging Spectroradiometer

Dombrowski, Mark, Surface Optics Corp., USA; Willson, paul, Army Armament Research, Development and Engineering Center, USA; LaBaw, Clayton, Jet Propulsion Lab., California Inst. of Tech., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 487-497; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Many imaging applications require quantitative determination of a scene's spectral radiance. This paper describes a new system capable of real-time spectroradiometric imagery. Operating at a full-spectrum update rate of 30Hz, this imager is capable of collecting a 30 point spectrum from each of three imaging heads: the first operates from 400 nm to 950 nm, with a 2% bandwidth; the second operates from 1.5 micro-m to 5.5 micro-m with a 1.5% bandwidth; the third operates from 5 micro-m to 12 micro-m, also at a 1.5% bandwidth. Standard image format is 256 x 256, with 512 x 512 possible in the VIS/NIR head. Spectra of up to 256 points are available at proportionately lower frame rates. In order to make such a tremendous amount of data more manageable, internal processing electronics perform four important operations on the spectral imagery data in real-time. First, all data in the spatial/spectral cube of data is spectro-radiometrically calibrated as it is collected. Second, to allow the imager to simulate sensors with arbitrary spectral response, any set of three spectral response functions may be loaded into the imager including delta functions to allow single wavelength viewing; the instrument then evaluates the integral of the product of the scene spectral radiances and the response function. Third, more powerful exploitation of the gathered spectral radiances can be effected by application of various spectral-matched filtering algorithms to identify pixels whose relative spectral radiance distribution matches a sought-after spectral radiance distribution, allowing materials-based identification and discrimination. Fourth, the instrument allows determination of spectral reflectance, surface temperature, and spectral emissivity, also in real-time. The spectral imaging technique used in the instrument allows tailoring of the frame rate and/or the spectral bandwidth to suit the scene radiance levels, i.e., frame rate can be reduced, or bandwidth increased to improve SNR when viewing low radiance scenes. The unique challenges of design and calibration are described. Pixel readout rates of 160 MHz, for full frame readout rates of 1000 Hz (512 x 512 image) present the first challenge; processing rates of nearly 600 million integer operations per second for sensor

emulation, or over 2 billion per second for matched filtering, present the second. Spatial and spectral calibration of 66,536 pixels (262,144 for the 512 x 512 version) and up to 1,000 spectral positions mandate novel decoupling methods to keep the required calibration memory to a reasonable size. Large radiometric dynamic range also requires care to maintain precision operation with minimum memory size.

Author

Imaging Techniques; Spectroradiometers; Real Time Operation; Spectral Emission; Emission Spectra; Imagery; Surface Properties; Physical Properties

19980010237 NASA Marshall Space Flight Center, Huntsville, AL USA

Diffuse Reflectance Mid-Infrared Spectroscopy as a Tool for the Identification of Surface Contamination on Sandblasted Metals

Powell, Louis G., Lockheed Martin Energy Systems, Inc., USA; Barber, Tye E., Sam Houston State Univ., USA; Neu, John T., Surface Optics Corp., USA; Nerren, Billy H., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 499-507; In English; Also announced as 19980010184

Contract(s)/Grant(s): DE-AC05-84OR-21400; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The SOC 400 Surface Inspection Machine/Infrared (SIMIR) is a small, ruggedized Fourier transform infrared spectrometer having dedicated diffuse reflectance optics. The SOC 400 was designed for the purpose of detecting (qualitatively and quantitatively) oil stains on the inside surface of solid rocket motor casings in the as-sandblasted and cleaned condition at levels approaching 1 mg. sq ft. The performance of this instrument is described using spectral mapping techniques.

Author

Inspection; Infrared Spectroscopy; Contamination; Infrared Spectra; Quality Control; Metal Surfaces; Surface Properties

19980010239 Meseran Co., Chattanooga, TN USA

Quantitative Measurement of Oily and Greasy Residues From 1 to 100,000 Nanograms

Anderson, John Lynde, Meseran Co., USA; Benkovich, Mark G., Meseran Co., USA; Russel, Ross F., Meseran Co., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 513-521; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This paper describes a new microcomputer-based analytical method carried out at ambient temperature and pressure for the direct quantitative measure of microorganic residues (e.g. oils and greases) to nanogram levels--ca 2 orders of magnitude below current technology and ca 1 order of magnitude below the lowest level specified in MILSTD 1246C ($A / 100 = 0.01 \text{ ug--}10 \text{ ng /sq cm}$). Calibration to these very low levels is based on a series of volumetric dilutions of typical residues with depositions of a 10 microL aliquot onto each 'clean' reference surface. The solvents used in the volumetric dilutions have non-volatile organic residue levels (NVOR) of less than 10 PPB. The amount of residue is measured when observing the evaporation of an added high-boiling-but-volatile Carbon-14 labeled compound (U S Nuclear Regulatory Commission EXEMPT) with which the microorganic residue forms a chemical solution. The log count vs time relationship is monitored by detecting beta particles emitted from molecules retained at the interface as a function of time. The slope of the evaporation curve, expressed as a positive integer, is an orderly inverse measure of the amount of residue--the higher the slope the less the residue and vice versa. The work reported represents a significant increase in the sensitivity of the Evaporative Rate Analysis (ERA) method. This advance is the first analytical method for the quantification of nanogram levels of microorganic residues at ambient conditions.

Author

Quantitative Analysis; Oils; Greases; Cleanliness; Evaporation; Residues; Microparticles; Detection; Computer Techniques

19980010427 NERAC, Inc., Tolland, CT USA

Analysis of Solid Surfaces: Latest Citations from the NTIS Bibliographic Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862602; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning techniques and equipment used in the analysis and characterization of solid surfaces. Spectroscopic, chemical, x-ray, and ion beam techniques are among those discussed. Descriptions and results of specific studies are included.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Surface Properties; Solid Surfaces

19980010436 Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC USA

Statement of Work for Low Concentration Inorganic Analytes in Water, ILC03.1

Mar. 1996; 204p; In English

Report No.(s): PB96-963504; EPA/540/R-96/016; OSWER-9240.1-32; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The Statements of Work (SOW) provide a technical and contractual framework for laboratories to apply EPA analytical methods to the analysis of environmental samples. The SOWs provide not only the analytical methods to be applied, but also the specific technical and contractual requirements by which EPA will evaluate the data. The SOWs are designed as part of the documentation for a contract between EPA and a commercial laboratory performing analyses in support of EPA Superfund programs. The resulting data may be used by EPA for a variety of purposes, such as determining the nature and extent of contamination at a hazardous waste site, assigning administrative priority to such based on the risk of exposure, determining appropriated clean-up actions and determining when remedial actions are complete.

NTIS

Chemical Analysis; Inorganic Compounds; Water Pollution; Low Concentrations; Contamination

19980010533 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Hybrid Quantum and Molecular Mechanics Embedded Cluster Models for Chemistry on Silicon and Silicon Carbide Surfaces

Shoemaker, James R., Air Force Inst. of Tech., USA; Jan. 1997; 336p; In English

Report No.(s): AD-A332159; AFIT-ENP/DSP/97-09; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Fabrication of silicon carbide (SiC) semiconductor devices are of interest for aerospace applications because of their high-temperature tolerance. Growth of an insulating SiO₂ layer on SiC is a poorly understood process, and sometimes produces interface defects that degrade device performance. Accurate theoretical models of surface chemistry, using quantum mechanics (QM), do not exist because of the huge computational cost of solving Schroedinger's equation for a molecular cluster large enough to represent a surface. Molecular mechanics (MM), which describes a molecule as a collection of atoms interacting through classical potentials, is a fast computational method, good at predicting molecular structure, but cannot accurately model chemical reactions. A new hybrid QM/MM computational method for surface chemistry was developed and applied to silicon and SiC surfaces. The addition of MM steric constraints was shown to have a large effect on the energetics of O atom adsorption on SiC. Adsorption of O atoms on Si-terminated SiC(111) favors above surface sites, in contrast to Si(111), but favors subsurface adsorption on C-terminated SiC(111). This difference, and the energetics of C atom etching via CO₂ desorption, can explain the observed poor performance of SiC devices in which insulating layers were grown on C-terminated surfaces.

DTIC

Silicon Carbides; Molecular Clusters; Quantum Mechanics

19980010536 Wyoming Univ., Dept. of Chemistry, Laramie, WY USA

Adsorption of Hazardous Compounds to Mineral Surfaces Final Report, 15 Mar. 1994 - 31 May 1997

Carron, Keith T., Wyoming Univ., USA; Buttry, Daniel A., Wyoming Univ., USA; Drever, James, Wyoming Univ., USA; Vance, TGeorge, Wyoming Univ., USA; Allen, Myron, Wyoming Univ., USA; Oct. 14, 1997; 26p; In English

Contract(s)/Grant(s): F49620-94-I-0194

Report No.(s): AD-A332071; AFOSR-TR-97-0669; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project entitled 'Adsorption of Hazardous Compounds to Mineral Surfaces' involved five faculty members from the University of Wyoming's Departments of Chemistry, Geology, SOIL Science, and Mathematics. The contribution from each individual research is enclosed in this final report. The results include two methods of modifying clays with cationic surfactants to enhance the adsorption of organic contaminants; modification of clays with cyclodextrins; studies of small aci adsorption to minerals; FTIR studies of adsorption to silicates; and stochastic analysis of flows in soils. The work with modified clays has lead to quantitative relationships that can be used to predict the sorptive behavior of yet untested modifiers. This data can be used to design improved treatment walls. Both Canon and Vance worked on a variety of contaminants to demonstrate these relationships. We synthesized a new surfactant that contains chlorines and showed enhanced sorption of chlorinated ethylenes. Buttry and Drever showed that small acids such as oxalic are capable of adsorbing to silica and can chelate with the mineral surface. The strong chelation is believed to lead to weathering or dissolution of the mineral surface. Buttry also showed that FTIR can be used to follow adsorption kinetics and to study surfactants adsorbed to mineral surfaces.

DTIC

Adsorption; Chelates; Chelation; Chlorination; Clays; Dissolving; Ethylene; Geology; Infrared Spectra; Kinetics; Minerals; Silicates; Silicon Dioxide; SOIL Science; SOILs

19980010539 Moscow Inst. of Aviation Technology, USSR

Autoignition Study on Kerosene in Supersonic Flow Final Report

Routovsky, Vladimir, Moscow Inst. of Aviation Technology, USSR; Jan. 1997; 61p; In English

Contract(s)/Grant(s): F61708-96-W-0276

Report No.(s): AD-A332522; EOARD-96-4089; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Moscow Aviation Institute as follows: The contractor will investigate autoignition of kerosene as described in his proposal dated August 1996.

DTIC

Supersonic Flow; Ignition; Kerosene; Spontaneous Combustion

19980010544 Japan Atomic Energy Research Inst., Advanced Science Research Center, Ibaraki, Japan

Proceedings of the 2nd meeting on tunneling reaction and low temperature chemistry: Tunneling reaction and biology

Yasuyuki, Aratono, Editor, Japan Atomic Energy Research Inst., Japan; Tetsuo, MiyazakiE, Editor, Nagoya Univ., Japan; Nov. 1996; 84p; In English; 2nd; Meeting on Tunneling Reaction and Low Temperature Chemistry, 22-23 Aug. 1996, Tokai, Japan; Sponsored by Japan Atomic Energy Research Inst., Japan; Meeting sponsored in part by Japanese Society of Radiation Chemistry. Sponsored in part by Chemical Society of Japan and Japan Radiation Research Society.

Report No.(s): JAERI-Conf-96-015; CONF-9608203; DE97-745388; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This issue is the collection of the paper presented at the title meeting. The 7 of the presented papers are indexed individually. (J.P.N.)

DOE

Conferences; Low Temperature; Bioassay; Electron Tunneling

19980010584 Paris VI Univ., France

Fifteenth Colloquium on High Resolution Molecular Spectroscopy: Programme and Abstracts

Sep. 16, 1997; 371p; In English; 15th; Colloquium on High Resolution Molecular Spectroscopy, 7-11 Sep. 1997, Glasgow, UK

Contract(s)/Grant(s): F61708-96-W-0298

Report No.(s): AD-A329575; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)); Abstracts Only, Microfiche

The Topics covered include: high-resolution molecular spectroscopy, including new experimental techniques, measurements, new analytic techniques and results, molecular databases.

DTIC

Molecular Spectroscopy; High Resolution

19980010623 Korea Electric Power Corp., Taejon Research Center, Taejon, Korea, Republic of

Development of wet-proofed catalyst and catalytic exchange process for tritium extraction

Song, Myung Jae, Korea Electric Power Corp., Korea, Republic of; Son, Soon Hwan, Korea Electric Power Corp., Korea, Republic of; Chung, Yang Gun, Korea Electric Power Corp., Korea, Republic of; Lee, Gab Bock, Korea Electric Power Corp., Korea, Republic of; 1995; 336p; In Korean

Report No.(s): KEPRI-93N-J02; DE96-768132; No Copyright; Avail: Issuing Activity (Natl. Technical Information Service (NTIS)); US Sales Only, Microfiche

To apply a liquid phase catalytic exchange(LPCE) process for the tritium extraction from tritiated heavy water, the wet proofed catalyst to allow the hydrogen isotopic exchange reaction between liquid water and hydrogen gas was developed. A styrene divinyl benzene copolymer was selected as an effective catalyst support and was prepared by suspension copolymerization. After post-treatment, final catalyst supports were dipped in chloroplatinic acid solution. The catalyst support had good physical properties at a particular preparation condition. The catalytic performance was successfully verified through hydrogen isotopic exchange reaction in the exchange column. A mathematical model for the tritium removal process consisted of LPCE front-ended process and cryogenic distillation process was established using the NTU-HTU method for LPCE column and the FUG method for cryogenic distillation column, respectively. A computer program was developed using the model and then used to investigate optimum design variables which affect the size of columns and tritium inventory.

DOE

Heavy Water; Liquid Phases; Mathematical Models; Catalytic Activity; Tritium; Ion Exchanging

19980010776 Lincoln Univ., Dept. of Physics, PA USA

High Voltage, Low Energy Material Interactions with Disassociation of Hydrocarbon Gases

Taylor, Edward O., Lincoln Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 437-445; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Operation of an internal combustion engine in a closed emission loop process is described. In addition, preliminary studies of the Al-Si carbide reaction chamber of the EPAT air pollution technology document disassociation of the combustion gases of carbon monoxide, carbon dioxide and hydrocarbons and the acid waste gases of nitrogen oxides and sulfur oxides from the waste gas stream occurring prior to re-entry into the diesel engine are reported.

Derived from text

Internal Combustion Engines; Hydrocarbons; Gas Dissociation

19980010779 San Jose State Univ., Dept. of Materials Engineering, CA USA

Determination of Oxygen Diffusion in Ionic Solids

Thomas, Shad, San Jose State Univ., USA; Hasenkamp, Erin, San Jose State Univ., USA; Selvaduray, Guna, San Jose State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 467-483; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The objective of this experiment is to demonstrate ionic diffusivity by measuring the current generated due to an oxygen partial pressure difference across a zirconia specimen.

Derived from text

Zirconium Oxides; Oxygen Ions; Partial Pressure; Ion Currents

19980010822 Department of the Navy, Washington, DC USA

Chemically Specific Patterning on Solid Surfaces Using Surface Immobilized Enzymes

Turner, David C., Inventor, Department of the Navy, USA; Gaber, Bruce P., Inventor, Department of the Navy, USA; Apr. 08, 1997; 19p; In English

Patent Info.: US-Patent-Appl-SN-841966

Report No.(s): AD-D018612; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This invention relates to an enzyme-substrate system where both the enzyme and substrate are immobilized to solid surfaces and the immobilized enzyme is manipulated such that it can chemically modify the immobilized substrate surface.

DTIC

Enzymes; Solid Surfaces; Patterns

19980010938 Technische Univ., Twente, Netherlands

Real Time Numerical Simulations and Visualization of Electrochemical Drilling

Noot, M. J., Technische Univ., Netherlands; Telea, A. C., Technische Univ., Netherlands; Jansen, J. K. M., Technische Univ., Netherlands; Mattheij, R. M. M., Technische Univ., Netherlands; Mar. 1997; 19p; In English

Report No.(s): PB97-204622; RANA-97-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Gas turbines have to be provided with holes in order to provide cooling; these holes are made using an electrochemical drilling technique. Since this process is tedious and expensive, computer simulations are very useful. Such a model needs to incorporate the relevant physical processes. A simulation system including real time user interaction and visualization together with efficient numerical techniques has been developed using an object oriented design.

NTIS

Gas Turbines; Computerized Simulation; Drilling

19980010942 National Inst. of Standards and Technology, Fire Science Div., Gaithersburg, MD USA

Meeting of the UJNR Panel on Fire Research and Safety, Volume 1

Beall, K. A., National Inst. of Standards and Technology, USA; Jun. 1997; 493p; In English; 13th, 13-20 Mar. 1996, Gaithersburg, MD, USA

Report No.(s): PB97-184196; NISTIR-6030-V1; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

The 13th meeting of the U.S.-Japan Panel on Fire Research and Safety was held at the National Institute of Standards and Technology March 13-20, 1996. The core of the meeting consisted of technical sessions on design/risk/hazard/performance standards, burning of real objects, experimental refinement and validation of fire models, suppression, materials testing, detection, and fires after earthquakes. The last of these topics took on special meaning in the wake of two disasters since the 12th meeting: a major earthquake in Northridge, California and the Great Hanshin-Awaji Earthquake on the largest Japanese island of Honshu.

In addition, the meeting hosted two one-day Symposia honoring two long-time principals of fire research in general and this UJNR Panel in particular. The first was in honor of Professor Edward Zukoski on the occasion of his retirement from the California Institute of Technology. The second was in memory of Professor Kunio Kawagoe of the Building Research Institute and Tokyo Science University.

NTIS

Fire Prevention; Fires; Conferences; Safety Management

19980010975 San Antonio Air Logistics Center, Kelly AFB, TX USA

Thermal Desorption: A Technology Review Final Report

Sullivan, Timothy P., San Antonio Air Logistics Center, USA; Jul. 22, 1997; 93p; In English
Report No.(s): AD-A331953; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

New and innovative technologies have been developed to treat hazardous wastes because of the high costs of remediation. One such technology is thermal desorption, which heats soils, sediments, and sludges to volatilize any contaminants present. Thermal desorption systems consist of units to heat the feedstock and secondary treatment systems to handle the off-gases generated during the heating process. This method of remediation has been demonstrated under the EPA's Superfund Innovative Technology Evaluation (SITE) program, thereby giving a means of evaluating the performance of the technology. The different aspects of desorption processes are discussed along with an in-depth review of thermal desorption system components. This is followed by an evaluation of thermal desorption as a treatment method by reviewing how well it meets cleanup goals and how safe it is for on-site workers. Through this evaluation, it was determined that thermal desorption is able to achieve cleanup goals, but the stack exhaust may contain contaminant levels that exceed recommended exposure values. Therefore, monitoring of airborne on-site contaminant concentrations is required to ensure the safety of personnel. With proper monitoring in place, thermal desorption can be used safely and effectively at contaminated sites.

DTIC

Thermal Radiation; Technology Utilization; Hazardous Wastes

19980011517 Edgewood Research Development and Engineering Center, Aberdeen Proving Ground, MD USA

Evaluation of a Post-Treatment Filter, Part 3, Experimental Study of Multicomponent Adsorption Breakthrough Final Report, Sep. 1995 - Oct. 1996

Buettner, Leonard C., Edgewood Research Development and Engineering Center, USA; Leduc, Charles, Edgewood Research Development and Engineering Center, USA; Mahle, John C., Edgewood Research Development and Engineering Center, USA; Aug. 1997; 45p; In English
Contract(s)/Grant(s): DA Proj. 102-62622-A-5-22

Report No.(s): AD-A332780; ERDEC-TR-317; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of adsorption breakthrough experiments were performed using 1-, 2-, and 8-component challenges to a laboratory-scale filter system. The eluted concentration profiles are discussed, and the effect of relative humidity is demonstrated. Measured vapor pressure data for DMMP and DIMP and adsorption equilibria for water on coconut shell carbon are also reported.

DTIC

Adsorption; Vapor Pressure; Humidity; Water; Gas Chromatography; Laboratory Equipment

19980011603 DynCorp, Environmental Programs Div., Alexandria, VA USA

Method 1639: Determination of Trace Elements in Ambient Waters by Stabilized Temperature Graphite Furnace Atomic Absorption. Draft, January 1996

Jan. 1996; 46p; In English

Report No.(s): PB96-193255; EPA/821/R-96/006; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The method provides procedures to determine dissolved elements in ambient waters at EPA water quality criteria (WQC) levels using stabilized temperature graphite furnace atomic absorption (GFAA). It may also be used to determine total recoverable element concentrations in these waters. The method contains QC procedures that will ensure that contamination will be detected when blanks accompanying samples are analyzed.

NTIS

Ambient Temperature; Graphite; Trace Elements; Water Quality

19980011604 DynCorp, Environmental Programs Div., Alexandria, VA USA

Method 1632: Determination of Inorganic Arsenic in Water by Hydride Generation Flame Atomic Absorption. Draft, January 1996

Jan. 1996; 35p; In English

Report No.(s): PB96-193248; EPA/821/R-06/002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The method is for determination of total inorganic arsenic (As) in filtered and unfiltered water by hydride generation and flame atomic absorption detection. The method is designed for measurement of dissolved and total arsenic in the range of 10-200 ng/L. The method includes suggestions for improvements in facilities and analytical techniques that should maximize the ability of the laboratory to make reliable trace metals determinations and minimize contamination.

NTIS

Absorption Spectroscopy; Hydrides; Metals; Water

19980011605 DynCorp, Environmental Programs Div., Alexandria, VA USA

Method 1640: Determination of Trace Elements in Ambient Waters by On-Line Chelation Preconcentration and Inductively Coupled Plasma-Mass Spectrometry. Draft, January 1996

Jan. 1996; 50p; In English

Report No.(s): PB96-193230; EPA/821/R-96/007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The method is for the determination of dissolved elements in ambient waters at EPA water quality criteria (WQC) levels using on-line chelation preconcentration and inductively coupled plasma-mass spectrometry (ICP-MS). It may also be used for determination of total recoverable element concentrations in these waters. The method contains QC procedures that will assure that contamination will be detected when blanks accompanying samples are analyzed.

NTIS

Mass Spectroscopy; On-Line Systems; Plasmas (Physics); Trace Elements; Water Quality

19980011618 Secretariat d'Etat a la Recherche, Lab. de Synthese Organique, Algiers, Algeria

Design experiment for Topo synthesis by using two process *Essai de modelisation de deux procedes de synthese de l'oxyde de tri-n-octyl phosphine (Topo)*

Meddour, Laaldja, Secretariat d'Etat a la Recherche, Algeria; Loullou, Mustapha, Secretariat d'Etat a la Recherche, Algeria; Megherbi, Mohamed, Secretariat d'Etat a la Recherche, Algeria; Feb. 1997; 9p; In French

Report No.(s): INIS-DZ-0001; DE97-633320; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The main objective of this work is the optimization of an organophosphorus compound synthesis. In this context, We have realized TO PO synthesis by means of two process: one based on POCL₃, and the other on P CL₃. To make in evidence the effects of three parameters (temperature, time and molar ratio from reactives) it is necessary to carry eight experiences '23' factorial based on all the possible combinations of the minimum and maximum values for the considered parameters in their respective variation ranges.

DOE

Temperature Effects; Synthesis (Chemistry); Time Dependence; Experiment Design

19980011621 DynCorp, Environmental Programs Div., Alexandria, VA USA

Method 1631: Mercury in Water by Oxidation, Purge and Trap, and Cold Vapor Atomic Fluorescence Spectrometry. Draft, January 1996

Jan. 1996; 38p; In English

Report No.(s): PB96-193214; EPA/821/R-96/001; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The method is for determination of total mercury (Hg) in filtered and unfiltered water by oxidation, purge and trap, desorption, and cold-vapor atomic fluorescence detection. The method is designed for measurement of total Hg in the range of 0.2-100 ng/L and may be extended to higher levels by selection of a smaller sample size. The method includes suggestions for improvements in facilities and analytical techniques that should maximize the ability of the laboratory to make reliable trace metals determinations and minimize contamination.

NTIS

Desorption; Fluorescence; Mercury (Metal); Metals; Oxidation; Purging; Spectrometers

19980011638 Moss Landing Marine Labs., CA USA

Method Development for Unenclosed Mesoscale Iron Enrichment Experiment Final Report, 1 Oct. 1993 - 31 Jul. 1997

Johnson, Kenneth, Moss Landing Marine Labs., USA; Coale, Kenneth, Moss Landing Marine Labs., USA; Dec. 15, 1997; 7p; In English

Contract(s)/Grant(s): N00014-94-I-0125

Report No.(s): AD-A332971; Rept-21-1509-0494; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The long-term goals of this work were to test the hypothesis that metals, especially iron, regulate rates of primary production in High Nutrient, Low Chlorophyll (HNLC) areas of the ocean. Two open ocean, iron enrichments were conducted in the eastern equatorial Pacific. Four nM iron was added in a single addition during the first experiment (Oct. 1993) and in three separate additions of 2, 1 and 1 nM in the second (May 1995). There was a strong response of the ecosystem with increases in primary production rates and plankton biomass. Large changes in bio-optical properties were also observed. The second experiment, in which higher iron concentrations were sustained for 1 week, produced a 20-fold increase in chlorophyll - a proxy for phytoplankton biomass. The results of the experiments have been reported in some 20 journal articles.

DTIC

Chlorophylls; Iron; Oceans

19980011669 Army Construction Engineering Research Lab., Champaign, IL USA

Comparative Evaluation of Ultrafiltration/Microfiltration Membranes for Removal of Nitrocellulose (NC) Fines from Wastewater Final Report

Kim, Byung J., Army Construction Engineering Research Lab., USA; Clark, Mark M., Army Construction Engineering Research Lab., USA; Lee, Yonghun, Army Construction Engineering Research Lab., USA; Jul. 1997; 94p; In English

Report No.(s): AD-A332826; USACERL-TR-97/116; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

NitroCellulose (NC) is a basic constituent for military gun propellants. NC wastewater is a byproduct of the NC manufacturing process. Crossflow MicroFiltration/UltraFiltration (MF/UF) may recover NC fines and allow the wastewater to be recycled. This bench-scale crossflow membrane filtration system was constructed to test the application of MF/UF technology to NC wastewater. This study was conducted in two phases. The results of Phase I were used to select a candidate membrane. In Phase II, a pilot-scale crossflow membrane filtration system was constructed to: (1) investigate the concentration polarization and fouling mechanism caused by NC fines during crossflow filtration of NC wastewater; (2) explore flux decline behavior of NC wastewater streams with various membranes; and (3) study the effects of operating parameters on flux decline behavior. This study found that: 1. UF membranes have a lower flux decline rate and a higher flux recovery than MF membranes, but UF membranes have a relatively low permeate production rate compared to MF membranes. 2. A critical membrane pore size of about 0.1 micron exists, at which point the worst flux performance occurs. 3. The cellulose-based hydrophilic membranes have the best flux performance.

DTIC

Water Treatment; Evaluation; Filtration; Membranes; Cellulose Nitrate

19980011691 Pittsburgh Univ., Dept. of Chemistry, Pittsburgh, PA USA

AASERT94, Novel Materials and Devices from Self-Assembled Periodic Structures Final Report

Asher, Sanford A., Pittsburgh Univ., USA; Nov. 1997; 4p; In English

Contract(s)/Grant(s): F49620-94-1-0268; AF Proj. 3484

Report No.(s): AD-A332624; AFOSR-TR-97-0602; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We request funding for one graduate student to work on a research program focused on developing new devices prepared from self-assembling submicron periodic structures. The work involves synthesis of new colloidal materials that can be used to create self-assembled sub micron periodicities, which will be used to develop new devices in the fields of optics, spectroscopy and separation science. We will create these submicron periodicities by utilizing the unique self-assembling property of monodisperse charged colloids; charged colloids self-assemble in solution to form BCC or FCC crystalline arrays (periodicities). We will examine the underlying physical phenomena responsible for this self-assembly process and will optimize the experimental conditions to prepare large defect free crystals. These crystals Bragg diffract light with extremely high efficiencies and are ideal for optical filtering applications.

DTIC

Crystal Defects; Periodic Variations; Spectroscopy; Colloids; Crystals

19980011978 Washington Univ., Saint Louis, MO USA

Sonochemical Synthesis of Molybdenum Disilicide (MoSi₂) Final Report, 1 Apr. 1993 - Dec. 1996

Sastry, S. M., Washington Univ., USA; Buhro, W. E., Washington Univ., USA; Suryanarayanan, R., Washington Univ., USA;

Trentler, T. J., Washington Univ., USA; Oct. 22, 1997; 105p; In English

Contract(s)/Grant(s): F49620-93-I-0131

Report No.(s): AD-A331930; AFOSR-97-0595TR; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Two successful solution phase synthesis methods were developed for the preparation of Nanocrystalline MoSi particles. The first method consisted of coreducing molybdenum and silicon halides by NaK alloy in an ultrasonically agitated hydrocarbon solvent followed by thermal processing at less than 1000 C under vacuum to eliminate byproduct salts. The second method was the reaction of MoCl₃ and Si in the solid state. These reactants underwent an ignition at approximately 500 C that resulted in the evolution of SiCl₄ and the formation of MoSi crystallites. Nanoparticles were compacted using a range of process variables. A micromechanism based model was developed for nanoparticle densification during uniaxial and hydrostatic pressing. The model takes into account the effects on densification of agglomeration, bulk and surface impurities, fewer dislocations per particle, low-stability of dislocations due to fine size, and other factors unique to nanoparticle systems. A good agreement of model predictions with experimental data was observed for a wide range of material and processing variables. Significant strength increases were observed for nanocrystalline MoSi₂. However, the expected improvements in fracture toughness and ductility were not observed presumably because of high levels of carbon and oxygen in the particles and residual porosity in the compacts.

DTIC

Mechanical Properties; Technologies; Synthesis (Chemistry); Molybdenum Compounds

19980011990 Envirogen, Inc., Lawrenceville, NJ USA

Characterization and Optimization of Dual Anaerobic/Aerobic Biofilm Process *Final Report, 3 Oct. 1995 - 2 Oct. 1996*

Togna, A. P., Envirogen, Inc., USA; DiStefano, Thomas D., Envirogen, Inc., USA; Arkins, Martha, Envirogen, Inc., USA; Dudiak, Karrie A., Envirogen, Inc., USA; Stefan, Robert J., Envirogen, Inc., USA; Jan. 30, 1997; 61p; In English

Contract(s)/Grant(s): F41624-95-C-4000

Report No.(s): AD-A332758; AL/EQ-TR-1996-0052; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of this Phase I STTR effort was to develop and characterize a dual anaerobic/aerobic biofilm process that promotes anaerobic reductive dehalogenation and aerobic cometabolic biodegradation, simultaneously, in a single biological reactor. The project focused on establishing the proof-of-concept for the simultaneous anaerobic dechlorination of tetrachloroethylene (PCE) and cometabolic oxidation of trichloroethylene (TCE) within a single laboratory-scale fluidized bed bioreactor (FBR) operated under bulk aerobic conditions. Concomitant BTEX (benzene, toluene, ethylbenzene, and xylenes) removal was also demonstrated. The bioreactor was inoculated with anaerobic sludge and a culture of the bacterium *Burkholderia cepacia* G4, which degrades TCE in the presence of Toluene. Over the length of the project, approximately 90 and 80 percent of the PCE and TCE added to the system was degraded, respectively. BTEX removal efficiencies were consistently greater than 99 percent. No dichloroethene or vinyl chloride was detected in liquid or vapor effluent samples. The bioreactor contained anaerobes that could dechlorinate PCE during serum bottle experiments. The anaerobes could use methanol or hydrogen, but not toluene, as electron donors to reduce PCE. Biomass removed from the bioreactor was also capable of degrading TCE in serum bottles at rates comparable to those observed during operation of ENVIROGEN's field-pilot TCE bioreactors.

DTIC

Aerobes; Anaerobes; Activity (Biology); Trichloroethylene; Oxidation; Electron Transfer; Chlorides; Biodegradation; Bacteria

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METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

19980009139 National Inst. of Standards and Technology, Gaithersburg, MD USA

Consolidation of Nanoscale Iron Powders

Livne, Z., Nuclear Research Center, Israel; Munitz, A., Nuclear Research Center, Israel; Rawers, J. C., Department of Energy, USA; Mar. 27, 1997; 32p; In English

Report No.(s): PB97-210785; NISTIR-5990; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The consolidation behavior of two types of nanoscale iron powders was studied. One powder consisted of nanoscale grains in nanoscale particles (NN) produced by evaporation/condensation. The other powder was made by ball milling and consisted of nanoscale grains in micrometer scale particles (NM). For comparison the consolidation of two microscale powders was also characterized. Consolidation techniques investigated were cold isostatic pressing (CIP), cold closed die compaction, hot isostatic pressing, and after CIP, sintering. Significant differences in consolidation behavior were found between the microscale and nonos-

cale powders and, indeed, between the nanoscale powders themselves. This behavior is believed at this time to be due to the ultra-fine grain size and, to some extent, the oxygen content of these materials.

NTIS

Metal Powder; Hot Isostatic Pressing; Grain Size; Powder (Particles); Iron; Cold Pressing; Compacting; Grinding (Comminution)

19980009226 NERAC, Inc., Tolland, CT USA

Laminated Metal and Steel Products. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866959; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design and manufacture of laminated products composed of metals, steels, polymers, plastics, and ceramics. Citations discuss laminated sheets, plates, belts, films, tapes, foils, and layers. Also discussed are applications in semiconductor devices, electronic parts, combustion engines, optical display, conveyors, building materials, and cans.

NTIS

Bibliographies; Laminates; Metal Plates; Design Analysis; Manufacturing

19980009234 NERAC, Inc., Tolland, CT USA

Electrodeposition of Alloys. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866439; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning electrodeposition of alloys with reference to bath composition and operating conditions. Citations discuss heat-, wear-, corrosion-, and erosion-resistance coatings and thin films for high precision machining and finishing. Discussed also are surface properties of electrodeposits, deposition processes with feedback systems, and pulsed electrodeposition. Molten salt, fused salt, and organometallic electrolyte systems are presented.

NTIS

Bibliographies; Electrodeposition; Alloys; Erosion; Corrosion Resistance; Thin Films; Thermal Resistance

19980009282 National Inst. of Standards and Technology, Gaithersburg, MD USA

Cold Compaction of Ball-Milled Nanograin Iron Alloys

Munitz, A., Nuclear Research Center, Israel; Levine, Z., Nuclear Research Center, Israel; Mar. 13, 1997; 29p; In English

Report No.(s): PB97-210793; NISTIR-5991; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cold consolidation of ball-milled powder is often unsuccessful because the ultrafine grain size and the worked condition of the powder particles make them extremely hard. Couple this with the typically large particle size of ball-milled powder and it is clear why compacts of these materials contain large porosity. A dynamic cold consolidation technique is presented that can produce high density, high hardness compacts from ball-milled nanograin powders. This method of cold compaction of various iron alloy powders involved drop-weight upsetting of cold isostatically pressed cylinders. The resulting compacts are characterized by optical and scanning electron microscopy, microhardness, and density measurements. For comparison, results of static, cold compaction tests up to 2.5 GPa are also reported on the same materials.

NTIS

Powder (Particles); Density Measurement; Grain Size; Scanning Electron Microscopy; Porosity; Static Tests; Iron Alloys

19980009329 Westinghouse Savannah River Co., Aiken, SC USA

Helium embrittlement model and program plan for weldability of ITER materials

Louthan, M. R., Jr., Westinghouse Savannah River Co., USA; Kanne, W. R., Jr., Westinghouse Savannah River Co., USA; Tosten, M. H., Westinghouse Savannah River Co., USA; Rankin, D. T., Westinghouse Savannah River Co., USA; Cross, B. J., Westinghouse Savannah River Co., USA; Feb. 1997; 40p; In English

Contract(s)/Grant(s): DE-AC09-96SR-18500

Report No.(s): WSRC-TR-97-0031; DE97-060154; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report presents a refined model of how helium embrittles irradiated stainless steel during welding. The model was developed based on experimental observations drawn from experience at the Savannah River Site and from an extensive literature

search. The model shows how helium content, stress, and temperature interact to produce embrittlement. The model takes into account defect structure, time, and gradients in stress, temperature and composition. The report also proposes an experimental program based on the refined helium embrittlement model. A parametric study of the effect of initial defect density on the resulting helium bubble distribution and weldability of tritium aged material is proposed to demonstrate the role that defects play in embrittlement. This study should include samples charged using vastly different aging times to obtain equivalent helium contents. Additionally, studies to establish the minimal sample thickness and size are needed for extrapolation to real structural materials. The results of these studies should provide a technical basis for the use of tritium aged materials to predict the weldability of irradiated structures. Use of tritium charged and aged material would provide a cost effective approach to developing weld repair techniques for ITER components.

DOE

Helium; Weldability; Embrittlement; Austenitic Stainless Steels; Mechanical Properties

19980009494 National Physical Lab., Versailles Project on Advanced Materials and Standards, Teddington, UK

Bend Strength Measurements for Hardmetals International Prestandardisation Collaborative Activity, Part 1, Rationale and Results. Technical Working Area 21: Mechanical Tests for Hardmetals

Roebuck, B., National Physical Lab., UK; Jun. 1996; 248p; In English

Report No.(s): PB96-216023; NPL-VAMAS-TR-22-Pt-1; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

This report is a compendium of results for a VAMAS international collaborative activity on bend strength for hardmetals. The interlaboratory tests involved fourteen laboratories, in eight countries testing seven materials to eleven testpiece geometries. The report provides the rationale for the activity as well as the results. It does not include detailed analysis of the data. A further report is planned within the next year giving recommendations for testing based on these results and will present a full analysis of the data. Preliminary examination of the data indicated that a very good agreement was obtained between tests at different laboratories. However, considerable differences in strength were observed for the different geometries. Also testpiece preparation method was an important factor. These issues will be discussed in more detail in the forthcoming analysis report.

NTIS

Bend Tests; Metals; Mechanical Properties

19980009507 China Nuclear Information Centre, Beijing, China

Influence of carbon monoxide to the surface layer of uranium metal and its oxides

Wang, Xiaoling, Southwest Inst. of Nuclear Physics and Chemistry, China; Fu, Yibei, Southwest Inst. of Nuclear Physics and Chemistry, China; Xie, Renshou, Southwest Inst. of Nuclear Physics and Chemistry, China; Huang, Ruiliang, Southwest Inst. of Nuclear Physics and Chemistry, China; Sep. 1996; 8p; In Chinese

Report No.(s): CNIC-01102; SINPC-0005; DE97-618559; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The surface structures of uranium metal and triuranium octaoxide (U₃O₈) and the influence of carbon monoxide to the surface layers have been studied by X-ray photoelectron spectroscopy (XPS). After exposure to carbon monoxide, contents of oxygen in the surface oxides of uranium metal and U₃O₈ are decreased and O/U ratios decrease 7.2%, 8.0% respectively. The investigation indicated the surface layers of uranium metal and its oxides were forbidden to further oxidation in the atmosphere of carbon monoxide.

DOE

Carbon Monoxide; Surface Layers; Metal Surfaces; Uranium; Uranium Oxides

19980009769 Sandia National Labs., Albuquerque, NM USA

Solidification modeling of Nb bearing superalloys

DuPont, J. N., Lehigh Univ., USA; Marder, A. R., Lehigh Univ., USA; Robino, C. V., Sandia National Labs., USA; [1997]; 13p; In English; 4th; International Special Emphasis Symposium on Superalloys 718, 625, 706 and Derivatives, 15-18 Jun. 1997, Pittsburgh, PA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-1669C; CONF-970605-3; DE97-007150; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The solidification behavior of experimental Ni base and Fe base superalloys containing Nb, Si, and C was studied using differential thermal analysis (DTA) and microstructural characterization techniques. The solidification reaction sequences responsible for microstructural development were found to be similar to those expected in the Ni-Nb-C ternary system, where the solute-rich

interdendritic liquid exhibited two eutectic-type reactions at the terminal stages of solidification: L (yields) ((gamma) + NbC) and L (yields) ((gamma) + Laves). A pseudo ternary (gamma)-Nb-C approach was developed to provide a quantitative description of solidification behavior for these experimental alloys. Solute redistribution calculations in the model are based on a previous approach developed by Mehrabian and Flemings, with modifications made to account for the high diffusion rate of C in the solid. Solidification parameters for Nb and C were determined through DTA and electron probe microanalysis techniques and used as inputs to the model. Reasonable agreement is found between calculated volume fractions of the (gamma)/NbC and (gamma)/Laves constituents and those measured experimentally. The modeling results permit detailed descriptions of the relation between alloy composition and microstructural evolution during solidification.

DOE

Heat Resistant Alloys; Microanalysis; Microstructure; Sequencing; Solidification; Solutes; Ternary Systems; Thermal Analysis

19980009839 Illinois Inst. of Tech., Mechanical and Aerospace Engineering Dept., Chicago, IL USA

Synthesis and Characterization of Mechanically Alloyed Ordered Intermetallic Materials *Final Report, 1 Jun. 1994 - 31 Jul. 1997*

Dollar, Marek, Illinois Inst. of Tech., USA; Dymek, Stan, Illinois Inst. of Tech., USA; Choo, Hahn, Illinois Inst. of Tech., USA; Nash, Philip, Illinois Inst. of Tech., USA; Ur, Soon-Chul, Illinois Inst. of Tech., USA; Oct. 30, 1997; 52p; In English
Contract(s)/Grant(s): F49620-94-I-0233

Report No.(s): AD-A332498; AFOSR-TR-97-0665; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report summarizes our studies aimed at improving high temperature strength and creep resistance of mechanically alloyed (MA) intermetallics. MA and hot extruded NiAl was subjected to normal grain growth and secondary recrystallization (SRx) and the latter mechanism proved to significantly improve creep resistance. The minimum creep rate in SRx material was decreased one to two orders of magnitude in comparison to creep in the as-extruded condition. A different approach was to first synthesize NiAl powder containing AlN dispersion and then to fabricate composites containing Al₂O₃ fibers. The composite processed in the present study is one of the strongest NiAl-based alloys ever produced. In yet another attempt to optimize high temperature properties of intermetallics more refractory, Nb₃Al-based materials were produced. It has been shown that mechanical alloying followed by hot pressing is a viable processing route for niobium aluminide intermetallics. The compressive strength of the examined materials was found to be superior to that in the NiAl, but the ductility was lower. The minimum creep rates were found to be approximately one order of magnitude less than those in MA NiAl. The creep rates in the present materials approach those in NASAIR 100, a first generation Ni-base single crystal superalloy.

DTIC

Intermetallics; Creep Strength; Alloying; Hot Pressing; Compressive Strength; Niobium Alloys; Heat Resistant Alloys

19980009843 NERAC, Inc., Tolland, CT USA

Die Materials: Latest Citations from METADEX

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863014; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning material selection when designing dies. Citations cover dies used for extruding, wire drawing, punching, blanking, forging, cold heading, pressing and stamping. Material heat treatment, surface treatment, and coating applications to extend tool life are considered.

NTIS

Bibliographies; Dies; Design Analysis

19980009859 NERAC, Inc., Tolland, CT USA

Protection of Aerospace Components: Latest Citations from METADEX

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862727; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the protection of aerospace components against surface wear and corrosion. Citations focus on surface coatings, including spray, vapor deposition, vacuum, and diffusion coatings technologies. Electrical and chemical plating of surfaces are also covered. Coverage includes pre-treatment of new and corroded surfaces to promote adhesion and bonding, testing of protected surfaces to assess their durability, wear, and corrosion resistance, and effects of surface

protection on the component's mechanical properties. Components include frames, empennages, skins, and landing gear of aircraft and helicopters. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Protective Coatings; Bibliographies; Corrosion Prevention; Aircraft Structures

19980009894 International Trade Commission Library, Washington, DC USA

Stainless Steel Wire Rod from Germany, Italy, Japan, Korea, Spain, Sweden, and Taiwan. Investigation No. 701-TA-373 and Nos. 731-TA-769-775 (Preliminary)

Sep. 1997; 148p; In English

Report No.(s): PB98-107006; USITC/PUB-3060; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

On the basis of the record developed in the subject investigations, the USA International Trade Commission determines, pursuant to section 703(a) of the Tariff Act of 1930 (19 U.S.C. section 1671b(a)), that there is a reasonable indication that an industry in the USA is materially injured or threatened with material injury by reason of imports from Italy of stainless steel wire rod, provided for in subheading 7221.00.00 of the Harmonized Tariff Schedule of the USA, that are alleged to be subsidized by the Government of Italy.

NTIS

Stainless Steels; Investigation; Wire; Economic Impact

19980009897 NERAC, Inc., Tolland, CT USA

Passivation of Stainless Steels. (Latest Citations from Information Services in Mechanical Engineering Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865688; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning chemical and structural properties of the passivated surfaces of stainless steel. Topics cover applications; analyses; corrosion behavior; and techniques of passivating films, coatings, and surface treatments. References cover techniques used to analyze the surface conditions, including ellipsometry, auger electron spectroscopy (AES), and x-ray photoelectron spectroscopy. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Passivity; Stainless Steels

19980009987 Delaware Univ., Dept. of Mathematical Sciences, Newark, DE USA

Corrosion of Metal Matrix Composites Final Report, Aug. 1996 - Aug. 1997

Hall, Ian W., Delaware Univ., USA; Nov. 1997; 43p; In English

Contract(s)/Grant(s): F49620-93-I-0500; AF Proj. 3484

Report No.(s): AD-A332029; AFOSR-97-0632TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Long term immersion testing and short term electrochemical testing have been carried out on two metal matrix composites and their corresponding unreinforced alloys. The composites were 15% alumina reinforced 6061-Al alloy and an Al-Si alloy reinforced with 20, 30, 40 or 55% SiC particles. It is shown that the pitting potentials are essentially independent of the presence or absence of reinforcement particles, as well as of their volume fraction. Corrosion is shown to be generally more severe in the composites than in the unreinforced alloy and weight loss rates may be 3 or 4 times greater. The presence of intermetallic particles strongly affects the corrosion and titanium/zirconium-rich particles, believed to arise as a consequence of the processing route, have been shown to have a particularly deleterious effect on corrosion of the 6061-Al alloy.

DTIC

Metal Matrix Composites; Corrosion Resistance

19980010041 Naval Research Lab., Plasma Physics Div., Washington, DC USA

Reflective Probing of the Electrical Conductivity of Hot Aluminum in the Solid, Liquid and Plasma Phases

Mostovych, Andrew N., Naval Research Lab., USA; Chan, Yung, Naval Research Lab., USA; Nov. 10, 1997; 16p; In English

Report No.(s): AD-A331819; NRL/MR/6700--97-7996; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The physics of dense aluminum in transition between metallic and insulating states of the solid, liquid, and plasma phases is probed in thermally equilibrated, inertially confined, laser heated targets. Time resolved laser probes measure the reflectivity of thin aluminum layers embedded inside the target. The electrical conductivity is inferred from the reflectivity with a free-electron

Drude conduction model. It is found to be sharply below liquid aluminum values and differs by at least an order of magnitude from current theoretical predictions.

DTIC

Electrical Resistivity; Reflectance; Liquid Metals; Aluminum; Remote Sensors

19980010101 Wisconsin Univ., Dept. of Materials Science and Engineering, Madison, WI USA

Synthesis of Solidification Structure in Undercooled Liquids *Final Report*

Perepezko, J. H.; Sep. 1997; 95p; In e

Contract(s)/Grant(s): DAAH04-93-G-0296

Report No.(s): AD-A332069; ARO-31042.12-MS; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

At high undercooling, the solidification of alloys can result in the suppression of the usual crystallization reactions and in the formation of nonequilibrium phases with distinct and novel microstructures. When a liquid is subdivided into a fine droplet dispersion in order to isolate nucleation catalysis, substantial undercooling may be observed before the onset of solidification, as demonstrated by the current work. An improved droplet technique has been applied to investigate the phase selection kinetics, nucleation catalysis reactions and thermal history that control microstructural evolution during solidification of highly undercooled melts. New developments involving droplet population and single droplet experiments in the application of nucleation catalysis to control undercooling have been used to identify specific active nucleants. In studies on Al-base alloys, an enhanced control and reproducibility of fine scale microstructure formation processes has been achieved in elevated temperature alloys and the new class of amorphous Al alloys. A continuing development of droplet methods to treat copper alloys and cast iron has been pursued along with the application of particle incorporated droplets to examine composite solidification processing. Throughout the experimental work, attention is given to the evaluation of the relevant metastable phase equilibria and reaction kinetics which are quite useful for the interpretation of solidification microstructure and in the identification of alloy design strategies. In addition, processing models have been developed further with the aim to formulate microstructure maps for high undercooling solidification in order to guide the control of microstructure synthesis.

DTIC

Solidification; Liquid Metals; Microstructure; Nucleation

19980010201 McDonnell-Douglas Aerospace, McDonnell Douglas Corp., Saint Louis, MO USA

The Use of IVD Aluminum Coating to Replace Cadmium Platings

Holmes, Vernon Lee, McDonnell-Douglas Aerospace, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 127-136; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The McDonnell Douglas Corporation's (MDC) Ion Vapor Deposition (IVD) of Aluminum coating process is a viable substitute for cadmium plating finding wide use throughout the DoD repair/maintenance community. Cadmium is a toxic metal, a suspected carcinogen, and on the EPA 17 hazardous materials list for reduction or elimination from the workplace. Cadmium waste streams arise from several maintenance operations: paint stripping (depaint media contaminated with cadmium), cadmium stripping, and cadmium plating. Once cadmium escapes into the environment, it can find its way into the water supply or food chain. In September 1992, OSHA issued an Expanded Standard which restricted the permissible exposure limits (PEL) to cadmium dust thereby increasing regulatory record keeping, medical surveillance, and cost for protection of workers above the Expanded Standard's action level. In contrast, aluminum and the IVD aluminum coating process are environmentally clean and worker friendly. Aluminum dust is nontoxic and is regulated only at the "nuisance dust" level by OSHA. To eliminate cadmium usage, MDC has assisted the Air Force, Navy, Marine, and Army repair/maintenance facilities with equipment recommendations, equipment installation, and operator and maintenance training on both the coating process and equipment. In addition, MDC contracted with the Sacramento Air Logistics Center (ALA) and with the Warner Robins-ALC to eliminate the use of cadmium. The Ogden-ALC has contracted MDC to evaluate IVD aluminum coating, zinc-nickel platings, and a SermeTel coating for replacement of cadmium plating in landing gear overhaul operations. Currently, MDC is evaluating cadmium replacement with IVD aluminum on the C-17 and has started a program to improve IVD aluminum coating process affordability through process cycle time reduction and updating equipment to state-of-the-art configuration. The MDC presentation will discuss program activities and accomplishments directed at cadmium elimination.

Author

Aluminum Coatings; Vapor Deposition; Environment Effects; Alternatives; Cadmium; Hazardous Materials; Paints

19980010223 Boeing Defense and Space Group, Seattle, WA USA

Nickel Strike Elimination

Adjorlolo, A. A., Boeing Defense and Space Group, USA; Nelson, M. J., Boeing Defense and Space Group, USA; Fielder, J. m.,

Boeing Defense and Space Group, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 343-362; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Nickel is one of seventeen materials targeted by the EPA for regulation. In fact a recent Boeing Safety, Health, and Environmental Affairs (SHEA) toxicology report declared that "nickel may present the same degree of carcinogenic risk as does cadmium and chromium." In anticipation of potential regulation, Boeing has voluntarily committed to reduce its use by 50% by 1995. Elimination of nickel within the company would target three current processes: electroless nickel plating (Boeing corporate process specification BAC 5728), electrolytic nickel plating, and nickel striking (BAC 5746). Of these three processes, nickel strike, which is covered in BAC 5746, is the most widely used; consequently its elimination carries a significant benefit for the Boeing Company. The present report summarizes an investigative effort made by Boeing Defense & Space Group Materials & Processes group to reduce Boeing nickel use by substitution of iron strike.

Author

Nickel Plate; Substitutes; Iron; Electroless Deposition; Electroplating; Nickel; Toxic Hazards

19980010224 Concurrent Technologies Corp., Johnstown, PA USA

Chrome-Free Conversion Coating Process Evaluation

Brezovec, Paul, Concurrent Technologies Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 363-372; In English; Also announced as 19980010184

Contract(s)/Grant(s): EPA-CR-822997-01-0; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The purpose of this US EPA project was to perform a full-scale evaluation of a chromium-free chemical conversion coating process. The metal substrate selected for screening purposes was 6061-T6 aluminum alloy. The chromium-free conversion coating, a fluotitanic acid modified organic chemistry from a commercial supplier, was demonstrated using the variable screening portion of a sequential experimental design and analysis strategy. The technique of analysis of variance, and the associated significance tests was applied. The approach consisted of using realistic manufacturing conditions to conversion coat aluminum followed by powder coating or cathodic electrocoating. Critical process operating parameters of the conversion coating baths, including the composition of discharges to the environment, were monitored and reported. Further, the quality of the coating properties, when compared to the customer's requirements, were tested and reported.

Author

Aluminum Alloys; Chromium; Coating; Surface Finishing; Aluminum Oxides; Surface Reactions; Corrosion Resistance; Coatings; Oxidation

19980010231 Lockheed Martin Missile and Space, Sunnyvale, CA USA

Minimization of Cyanide Waste: Rejuvenation of Silver Cyanide Plating Bath

Tam, Tom M., Lockheed Martin Missile and Space, USA; Larson, Jeff C., Lockheed Martin Missile and Space, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 437-453; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The LMMS Sunnyvale Facility has been generating about 1000 lb of cyanide laden waste solution each year. The waste is a result of having to dispose of silver cyanide plating bath due to carbonate build up. In this presentation we will report on a method that we evaluated and used to rejuvenate a Silver Cyanide Plating bath. The method we used is to add Barium Hydroxide to the plating bath which selectively removes the carbonate as Barium Carbonate. The implementation of this rejuvenation has enabled us to: minimize the cyanide waste, improve the process control, and save a significant amount of silver. All these have resulted in a considerable cost savings to the company.

Author

Cyanides; Waste Management; Electroplating; Baths; Carbonates; Chemical Reactions; Hazardous Wastes; Waste Treatment

19980010232 Armstrong Lab., Environics Directorate, Tyndall AFB, FL USA

An Air Force Pollution Prevention Initiative: 'Demonstration of a Non-Chromate Conversion Coating for Ion Vapor Deposition (IVD) Aluminum'

Smith, Anthony Ray, Armstrong Lab., USA; Singer, Carl, Acurex Corp., USA; Hall, Brent, Acurex Corp., USA; Jozewicz, Wojciech, Acurex Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 455-460; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The goal of this project is to demonstrate a non-chromate alternative to chromate conversion coatings currently used for IVD aluminum-coated parts. When successful, this effort will improve the work environment at Air Force Air Logistics Centers (ALCs), reduce hazardous waste production from the IVD aluminum/conversion coating process, and virtually eliminate the need for expensive pollution control equipment. This alternative technology will replace the chromate conversion coating, comply with

ML C83488, and reduces hazardous waste generation and disposal. Stringent environmental and occupational health regulations for Air Force electroplating facilities are restricting pollutant discharges from the ALCs and have escalated the cost of waste disposal. Chromate conversion coatings contain hexavalent chrome, a known human carcinogen. Demonstration and validation of alternative conversion coatings for IVD aluminum are needed to ensure that coatings for Air Force aircraft parts will meet performance criteria in military specifications in an environmentally friendly manner. The Air Force ALCs are eliminating the use of cadmium processing for aircraft maintenance and overhaul in order to eliminate hazardous cadmium wastestreams. With the exception of a sacrificial, corrosion-resistant barrier, the replacement process, ion vapor deposition (IVD) of aluminum, eliminates many of the environmental problems associated with cadmium processing. The traditional corrosion barrier used with the IVD process uses a chromate conversion coating to provide additional corrosion protection and an improved base for paint or primer adhesion. The Air Force (Armstrong Laboratory, Environics Directorate) entered a contract with McDonnell Douglas Aerospace-East (MDA-E) in 1993 to identify a non-chromate coating alternative to traditional chromate conversion coating for IVD aluminum. A number of conversion coating candidates were tested for adhesion and corrosion protection. In addition, the candidate coatings were subjected to a number of performance tests which included electrical resistance, adhesion, corrosion, humidity resistance, and fluid resistance. Results were then compared with a baseline chromate conversion coated panel. Following the full test cycle, the best candidate non-chromate conversion coatings were selected for the Armstrong Laboratory's demonstration and validation project which began in May, 1996. Acurex Environmental Corp. is the contractor performing the demonstration and WR-ALC, Robins Air Force Base, Georgia is the demonstration facility.

Author

Aircraft Parts; Chromates; Coatings; Hazardous Wastes; Environment Effects; Vapor Deposition; Aluminum Coatings

19980010428 NERAC, Inc., Tolland, CT USA

Physical and Electrical Properties of Beryllium Base Alloys. (Latest Citations from METADEX)

Feb. 1996; In English

Report No.(s): PB96-862503; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties of beryllium base alloys. Included are discussions of magnetic, mechanical, and thermodynamic properties. Special emphasis is placed on superconductivity and magnetic susceptibility. The oxidation of beryllium base alloys in a variety of atmospheres is also reviewed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Beryllium Alloys; Electrical Properties

19980010442 NERAC, Inc., Tolland, CT USA

Brazing. Alloys, Atmospheres, Fluxes: (Latest Citations from METADEX)

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862859; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning braze filler materials and alloys used in joining metal, composite, and ceramic parts. Citations cover joint surface pretreatment, flux applications, and atmosphere control. Brazing of similar and dissimilar materials is considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Brazing

19980010457 Carnegie-Mellon Univ., Dept. of Metallurgical Engineering and Materials Science, Pittsburgh, PA USA

Creep Resistance of Gamma TiAl Microstructures Final Report, 1 Jul. 1996 - 30 Jun. 1997

Pollock, Tresa M., Carnegie-Mellon Univ., USA; Sep. 1997; 3p; In English

Contract(s)/Grant(s): F49620-94-I-0380

Report No.(s): AD-A330577; AFOSR-97-0526TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The development of microstructure and its influence on creep properties has been studied in two Ti-48Al-2Cr-2Nb alloys. The addition of 0.9 atomic % Mo to the Ti-48Al-2Cr-2Nb composition results in the formation of the ordered B2 phase. The presence of this phase along with a small amount of alpha2 at grain boundaries was found to effectively limit grain growth at 1125 deg C during heat treatments that produce equiaxed gamma microstructures. The gamma -> alpha transformation produces alpha2 plates with several orientation variants within gamma grains during subsequent annealing of the equiaxed gamma microstructures below the alpha-transus. Formation of this alpha2 morphology results from rapid up-quenching and this structure persists through anneal-

ing, cooling, and creep testing. Differences in minimum creep rates for several microstructures containing varying amounts multi or single variant gamma/a2 grains are shown to be minimal. The presence of Mo has also resulted in improved creep resistance in equiaxed gamma, and gamma + a2 + B2 structures as compared to similar microstructures in the Ti-48Al-2Cr-2Nb alloy. Deformation during creep at 760 deg C at stresses between 200 and 400 MPa occurs by a combination of twinning and dislocation glide without recrystallization, resulting in power-law stress exponents in the range of 6 to 9. Only minimal strain path dependence of the minimum creep rate was detected in a comparison of creep rates in stress jump, stress drop and single stress tests.

DTIC

Annealing; Atoms; Cooling; Creep Tests; Deformation; Drop Tests; Exponents; Gliding

19980010554 Japan Atomic Energy Research Inst., Dept. of Reactor Safety Research, Tokyo, Japan

Fracture toughness and mechanical properties of aluminum alloys for research reactors

Shibata, Katsuyuki, Japan Atomic Energy Research Inst., Japan; Kikuchi, Hiroyuki, Japan Atomic Energy Research Inst., Japan; Kaneda, Yoshiro, Japan Atomic Energy Research Inst., Japan; Kodaira, Tsuneo, Japan Atomic Energy Research Inst., Japan; Ichikawa, Hiroki, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 65p; In Japanese

Report No.(s): JAERI-Research-97-015; DE97-745377; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Aluminum alloys have been used as the structural material of the research reactor or because of their good properties for corrosion resistance and machinability as well as high neutron economy. In order to respond to the needs to maintain the aged core structure and to utilize for the high performance research reactor, irradiation test of aluminum alloys were initiated to provide the data base on the toughness and strength of aluminum alloys aged under research reactor condition. This report describes the results of tensile test, hardness test, Charpy impact test and fracture toughness test on A5052-O and A6061-T6 aluminum alloys under the unirradiated condition. From those tests, it was found that base metal of A5052-O has the highest toughness, welded joints of A5052-O and A6061-T6 is equivalent and have medium toughness, and base metal of A6061-T6 has very low toughness.

DOE

Aluminum Alloys; Fracture Strength; Toughness; Reactor Materials

19980010557 NERAC, Inc., Tolland, CT USA

Metals for Cryogenic Applications (Latest Citations from METADEX)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-862941; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning technology and development of metals for cryogenic applications. The processing, mechanical properties, and compositions of specific alloys are detailed. Applications include aircraft, rockets, spacecraft, and equipment used to store and transport cryogenic fluids. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Cryogenics; Metals

19980010562 NERAC, Inc., Tolland, CT USA

Recycling Zinc. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English

Report No.(s): PB96-866405; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the processes, energy use patterns, trends, prospective sources, etc., of zinc recycling. Processes discussed include distillation, pyrochemical processing, and electrorefining. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Recycling; Zinc

19980010563 NERAC, Inc., Tolland, CT USA

Corrosion Protection by Means of Galvanizing. (Latest Citations from Information Services in Mechanical Engineering Database)

Mar. 1996; In English

Report No.(s): PB96-866413; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the protection of surfaces against corrosion using galvanizing techniques. Methods of application and surface finishing are included. Emphasis is placed upon small parts such as wire, bolts, and tubing. One-sided coating for automotive applications is also presented. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Corrosion Prevention; Zinc Coatings

19980010620 Wright State Univ., Dept. of Mechanical and Materials Engineering, Dayton, OH USA

AASERT-92 Experimental Verification of Optimally Designed Metal Forming Processes Final Report, 1 Jun. 1993 - 31 May 1996

Grandhi, Ramana V., Wright State Univ., USA; Oct. 22, 1996; 41p; In English

Contract(s)/Grant(s): F49620-93-I-0313

Report No.(s): AD-A329772; AFOSR-97-0446TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research focuses on developing a method for the preform design engineering of material forming processes. In this research, a sensitivity analysis method for preform die shape design in material forming processes is developed using the rigid visco-plastic finite element method. The preform die shapes are represented by cubic B-spline curves. The control points or coefficients of B-spline are used as the design variables. The optimization problem is to minimize the zone where the realized and desired final forging shapes do not coincide. The sensitivities of the objective function, nodal coordinates, and nodal velocities with respect to the design variables are developed in detail. A procedure for computing the sensitivities of history-dependent functions is presented. The remeshing procedure and the interpolation/transfer of the history-dependent parameters, such as effective strain, are stated. The procedures of sensitivity analysis based preform die design are also described. In addition, a method for the adjustment of the volume loss resulting from the finite element analysis is given in order to make the workpiece volume consistent in each optimization iteration. The method developed in this report is used to design the preform die shape of H-shaped forging processes, including plane strain and axisymmetric deformations. The results show that a flashless forging with a complete die fill is realized using the optimized preform die shape.

DTIC

Metal Working; Finite Element Method; Forging

19980010744 Loyola Coll., Dept. of Electrical Engineering & Engineering Science, Baltimore, MD USA

Metallurgical Evaluation of Historic Wrought Iron to Provide Insights into Metal-Forming Operations and Resultant Microstructure

Elban, Wayne L., Loyola Coll., USA; Elban, Mark A., Carroll Christian High School, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 27-53; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Using standard procedures for the microstructural characterization of metals and alloys, the metallographic preparation and examination of wrought iron is described. The material investigated was taken from a hot rolled plate that had a bend at one end. Since wrought iron is expected to be anisotropic, longitudinal, planar, and transverse sections were studied. Once prepared, the samples were examined using reflected light microscopy. Consistent with other published photomicrographs, the microstructure is highly inhomogeneous. Several features were evaluated qualitatively, including slag characteristics (shape, distribution, orientation, and size), porosity and cracks, ferrite grain shape and size distribution, and the location of slag relative to ferrite grain boundaries. The microstructure indicates that the iron was most probably made in the 1800s. For the longitudinal sample in particular, the slag distribution provided flow lines allowing identification of the hot rolling direction and showing the bulk material response to the forming operations. In addition (optional activity), microindentation hardness testing was performed. Limited diamond pyramid (Vickers) testing was done to relate to measurements on other historic wrought iron. More extensive diamond pyramid (Knoop) testing was done to assess plastic anisotropy and its relationship to historic metal-forming operations.

Author

Wrought Alloys; Iron Alloys; Metal Working; Forming Techniques; Microstructure; Mechanical Properties

19980010746 Utah Univ., Dept. of Metallurgical Engineering, Salt Lake City, UT USA

Identification of an Unknown Steel Specimen

Callister, William D., Jr., Utah Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 65-74; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This experiment is used by the author as a "capstone" experience for a sophomore-level materials science and engineering laboratory course; it is analogous to the traditional unknown determination that is used in many freshmen chemistry qualitative

analysis classes. The experiment conducted previous to this one involves the Jominy end-quench test. In this Jominy experiment, each group of two or three students, has the opportunity to perform an end-quench test on each of plain-carbon (1040) steel and alloy (either 4140 or 4340) steels. Therefore, the students have some understanding as to the relationships that exist between heat treatment (i.e., cooling rate), microstructure, and hardness for both plain-carbon and alloy steels.

Derived from text

Heat Treatment; Qualitative Analysis; Experimentation; Education; Steels; Alloys

19980010747 San Jose State Univ., Dept. of Materials Engineering, CA USA

Measurement of Springback Angle in Sheet Bending

Hilden, J., San Jose State Univ., USA; Lewis, K., San Jose State Univ., USA; Meamaripour, A., San Jose State Univ., USA; Selvaduray, Guna, San Jose State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 75-91; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Well over half of all world wide metal production results from forming operations on sheet-metals. In nearly all of these forming operations, the metal must be bent in at least one area. Examples of this include forming of aluminum rain gutters, aircraft skins, auto bodies, appliance shells, soda cans, fan blades, etc. Because of the extremely high volume of these sheet metal forming operations, considerable attention has been focused on perfecting sheet metal bending operations. Specifically, the issue of spring back has been well studied and documented for the case of cold working metallic sheets. The objectives of this experiment are to determine the springback ratio of sheet metal specimens as a function of bend radius, and to compare these values to expected springback ratios using a mathematical prediction.

Derived from text

Metal Sheets; Metal Working; Forming Techniques; Experimentation; Elastic Bending

19980010753 Texas A&M Univ., Dept. of Mechanical Engineering, College Station, TX USA

The Application of Computers to the Determination of Corrosion Rates for Metals in Aqueous Solutions

Griffin, R. B., Texas A&M Univ., USA; Cornwell, L. R., Texas A&M Univ., USA; Ridings, Holly E., Texas A&M Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 183-197; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

It has been variously estimated that corrosion costs the industrialized world 3.5 to 4 % of a country's Gross National Product (GNP). About 25% of the steel produced each year goes to replace metal that has been lost due to corrosion. Application of current technology and information can significantly reduce the losses resulting from corrosion. This has been estimated to be approximately 25%. Many universities have some type of corrosion program both in the US and abroad. A listing of universities with corrosion programs is published each year in Materials Performance, a publication of National Association of Corrosion Engineers (NACE), Houston, TX.

Author

Corrosion; Computer Techniques; Costs; Metals; Technologies

19980010759 Purdue Univ., School of Technology, West Lafayette, IN USA

Second Steel Heat Treatment Lab: Austempering

Olesak, Patricia J., Purdue Univ., USA; National Educators' Workshop: Update 1996; Jul. 1997, pp. 255-259; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Martensite is produced by austenitizing steel, then quickly water quenching the steel to avoid the nose on the T-T-T diagram and cool the steel below the M(sub f) line. This is a conventional steel heat treatment with a water quench. The steel produced is quite hard and very brittle and consequently, not very tough. If during cooling, the steel is cooled slowly enough to intersect the first curve of the T-T-T diagram, the transformation start curve (above the nose of the T-T-T diagram) then water quenched so as to not intersect the second curve, a combination of martensite and pearlite microstructure is achieved. This microstructure is softer, and much more ductile. An intermediate hardness, yet tough steel is achieved through this quench. An interrupted quench processing, or austempering, is achieved when austenitized steels are cooled fast enough to avoid the nose on the T-T-T diagram. They are cooled to a temperature slightly higher than M(sub s) start line and then held at that temperature (generally temperatures of 200-375 C) for various lengths of time, then water quenched. The goal is to intersect the transformation start curve but not the transformation end curve. The resulting microstructure is a combination of martensite and bainite. Bainite is similar to pearlite in many ways, yet it is considerably harder. The amount of bainite to form is a result of the 'interrupted' quench time, which allows austenite to transform to bainite. As the 'interrupted' quench time increases (more bainite, less martensite), hardness decreases.

Author

Heat Treatment; Martensite; Experimentation; Temperature Effects; Brittleness

19980010770 Los Alamos National Lab., NM USA

Experimental Investigation of Hydrogen Transport Through Metals

Moss, T. S., Los Alamos National Lab., USA; Dye, R. C., Los Alamos National Lab., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 351-358; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

With the steady depletion of fossil fuel reserves, hydrogen based energy sources are becoming increasingly attractive. This is creating a continued and building interest in developing economically viable methods for hydrogen separation from additional sources such as natural gas and methanol reforming. Furthermore, such separation techniques can also be applied to the chemical industry. While hydrogen selective membranes have been considered for applications in these areas, their use has generally been limited due to cost and hydrogen embrittlement of the metal. The most popular metal used for hydrogen separation has been palladium or its alloys. Indeed, the palladium/hydrogen system has been studied extensively, beginning with the early work of Graham well over a hundred years ago. While palladium is an attractive membrane material due to its ability to readily dissociate molecular hydrogen to atomic hydrogen at its surface, several problems remain.

Author

Hydrogen-Based Energy; Transport Theory; Transport Properties; Palladium; Fossil Fuels; Metals; Hydrogen

19980010821 Department of the Navy, Washington, DC USA

High Temperature Shape Memory Effect in Ruthenium Alloys

Fonda, Richard, Inventor, Department of the Navy, USA; Vandermeer, Roy, Inventor, Department of the Navy, USA; Jones, Harry, Inventor, Department of the Navy, USA; Sep. 10, 1997; 29p; In English

Patent Info.: US-Patent-Appl-SN-940734

Report No.(s): AD-D018611; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The shape memory effect is observed in alloys which undergo a thermoelastic martensitic transformation. This transformation is characterized by the continuous growth of martensite plates as the temperature is lowered and, comparably, the continuous disappearance of these martensite plates as the temperature is subsequently raised. The reversible nature of this transformation can lead to the many interesting features of the shape memory effect. One effect is superelasticity, which occurs above the transformation temperature and consists of the activation of the martensitic transformation in response to an external stress. Any shape changes produced during the transformation are reversed upon release of the external stress. Below the transformation temperature, the material can exhibit a one way or two-way shape memory effect. The one-way shape memory effect exists when the material is deformed below the martensitic transformation temperature and then reverts to its original shape upon heating to above the transformation temperature. With appropriate mechanical and thermal training of the material this effect can be modified into a two-way shape memory effect. This two way effect is a reversible shape change which results during both heating and cooling the material through the transformation temperature range.

DTIC

Ruthenium Alloys; Shape Memory Alloys; Martensitic Transformation

19980011591 Istituto Nazionale di Fisica Nucleare, Lab. Nazionale di Frascati, Frascati, Italy

Study of deuterium charging behaviour in palladium and palladium alloy plates, changing surface treatments, by ms pulsed electrolysis

Celani, F., Istituto Nazionale di Fisica Nucleare, Italy; Spallone, A., Istituto Nazionale di Fisica Nucleare, Italy; Tripodi, P., Istituto Nazionale di Fisica Nucleare, Italy; Petrocchi, A., Istituto Nazionale di Fisica Nucleare, Italy; DiGiacchino, D., Istituto Nazionale di Fisica Nucleare, Italy; Marini, P., Skitek-IRI, Italy; DiStefano, V., Skitek-IRI, Italy; Diociaiuti, M., Istituto Superiore di Sanita, Italy; Mancini, A., Orim s.r.l., Italy; Jul. 1995; 8p; In English; 5th; International Conference on Cold Fusion, 9-13 Apr. 1995, Monte Carlo, Monaco

Report No.(s): LNF-P-95-043; CONF-9504284-1; DE97-732497; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

A systematic study about deuterium loading in palladium has been performed. Palladium cold worked plates and palladium alloy plates have been used as comparison. A proper plate surface oxidation has been performed and anomalous absorption rates have been measured. A high peak current (15 A), short width pulse (duration 1 micro-s) electrolysis technique has been used to test all cathode plates and it is visible that this technique permits to reach very high D/Pd loading values (around 1/1 or even more for palladium). At the beginning of the loading, in close relation with the anomalous absorption rate, a bump of excess heat has been measured in two similar oxidized surface palladium plates. All these tests show that the loading is completely reproducible.

DOE

Palladium Alloys; Electrolysis; Metal Plates; Deuterium

19980011630 Japan Atomic Energy Research Inst., Dept. of Human Plasma Research, Tokyo, Japan

Material characteristic of Ti alloy (Ti-6Al-4V)

Toyoshima, Noboru, Compiler, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 106p; In Japanese
Report No.(s): JAERI-Research-97-012; DE97-750681; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In regard to material characteristic of Ti alloy (Ti-6Al-4V), the following matters are provided by experiments. 1. In high temperature permeation behavior of implanted deuterium ion (0.5 keV, 6.4×10^{18} D(sup +) ions/sq m s, approx 760 K), the ratio of permeation flux to incident flux ranges from 3.3×10^{-3} at 633 K to 4.8×10^{-3} at 753 K. The activation energy of permeation is 0.12 eV in this temperature region above 600 K. At temperatures below 600 K, the permeation flux of deuterium decreases drastically and the implanted ions remain in the alloy. 2. Radioactivation analysis using 14 MeV fast neutron shows that Ti-6Al-4V alloy contains higher values of principal ingredients, Al, V, Fe, than that recorded at the chemical composition of Ti alloy, and also, contains impurities with Ni, Co and Mn. 3. Fraction of about 0.095 wt % H₂ were absorbed in the test specimens, and tensile strength test was carried out. Under the condition of the hydrogen pressure 50 torr and temperature approx 500 C. The results show that there is no degradation in mechanical properties for absorption of with less than 0.04 wt % H₂. The tensile strength of wilding specimens have almost the same as that without wilding. Ti alloy, as a material of vacuum vessel of nuclear fusion device, must be selected to that with less impurities, particularly Co, by radioactivation analysis, and must be used under the temperature of 200-300 C, where hydrogen absorption does not make too progress. It is considered that Ti alloy can be used with less than 0.04 wt % H₂ absorption in viewpoint of material mechanical strength.

DOE

Titanium Alloys; Mechanical Properties; Steady State; Reactor Materials

19980011642 SRI International Corp., Menlo Park, CA USA

Characterization of Hydrogen Ingress in High-Strength Alloys Final Report, 20 Sep. 1995 - 19 Sep. 1997

Pound, Bruce G., SRI International Corp., USA; Nov. 1997; 93p; In English

Contract(s)/Grant(s): N00014-95-C-0313

Report No.(s): AD-A332984; SRI-PYU-7495; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The effect of heat treatment on irreversible hydrogen trapping was investigated for high strength steels (4340, 18Ni (250), and AerMet 100), alloy K-500, and precipitation-hardened alloys (X-750 and 18Ni (250) steel), with the goal of providing insight into the factors governing the intrinsic susceptibility to hydrogen embrittlement (HE). A potentiostatic pulse technique was used to determine irreversible trapping constants (k), which were compared with changes in strength and microstructure. Irreversible trapping in AerMet 100 is associated with two types of carbide, depending on the aging temperature. 4340 steel also undergoes a change in its principal type of irreversible trap with decreasing yield strength. The type of heat treatment for alloy K-500 can produce differences in trapping. Annealing increases k considerably, whereas aging has a negligible effect for the annealed alloy but can result in an increase for the unannealed alloy. 18Ni steel and alloy X-750 both show an increase in k with aging. Carbonitride particles provide the principal irreversible traps in the unaged alloys and appear to be one of the principal traps in aged X-750 but not in the aged steel. The order of the k values for AerMet 100, 4340, 18Ni (250), and two previously studied steels --H11 and 18Ni (300)--inversely parallels their threshold stress intensities for stress corrosion cracking. A correlation was found between k and the observed resistance to HE also for annealed/aged and direct-aged alloy K-500, alloys X-750 and 718, and 18Ni (250) steel and alloy 718.

DTIC

Aging (Metallurgy); Annealing; Carbides; Heat Treatment; High Strength Alloys; High Strength Steels; Stress Corrosion Cracking; Temperature Effects

19980011649 Army Research Lab., Weapons and Materials Research Lab., Aberdeen Proving Ground, MD USA

Chemical Modification and Attempted Polymerization of Self-Assembled Monolayers of Hexadecanedioic Acid at Aluminum Surfaces Final Report, Oct. 1996 - Mar. 1997

Seger, Lawrence D., Army Research Lab., USA; Rasimas, Jeffrey P., Army Research Lab., USA; Pesce-Rodriquez, Rose, Army Research Lab., USA; Fifer, Robert, Army Research Lab., USA; Nov. 1997; 34p; In English

Contract(s)/Grant(s): DA Proj. 1L1-61102-AH-43

Report No.(s): AD-A331712; ARL-TR-1553; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A self-assembled monolayer (SAM) of hexadecanedioic acid (HDDA) was prepared on an aluminum substrate for purposes of preventing or retarding the consequences of atmospheric corrosion. to enhance the protective qualities of the film, a scheme was developed to polymerize the exposed carboxylic acid functional groups, while enhancing the thickness of the film. to accomplish this, an attempt was made to cross-link the HDDA with octyltrichlorosilane (OTS). Subsequent experiments using a perfluorinated carboxylic acid as the base layer suggest that the OTS is aggressive enough toward the aluminum surface to completely

remove the underlying organic SAM and displace it with siloxane (Si-O) linkages at the metal surface. Polarization modulated Fourier transform infrared absorption spectroscopy (PM-FTRIRRAS) and contact angle measurements confirm the displacement.

DTIC

Metal Surfaces; Carboxylic Acids; Atmospheric Effects; Corrosion; Polymerization; Crosslinking

19980011651 Naval Postgraduate School, Monterey, CA USA

The Effects of Titanium on the Mechanical Properties of Shielded Metal Arc Welding (SMAW) of C-MN Steels

Greene, Michael K., Naval Postgraduate School, USA; Mar. 1997; 108p; In English

Report No.(s): AD-A331716; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The strength and toughness of low alloy steel shielded metal arc weld (SMAW) metal is markedly improved by the presence of the microconstituent acicular ferrite. Since acicular ferrite is nucleated by the non-metallic inclusions present in the weld metal. Its presence is determined by the size, number, distribution and chemical composition of these inclusions. Previous work has shown that inclusions containing no titanium are usually ineffective as nucleates of acicular ferrite in some C-Mn steel weld metal whereas inclusions containing small amounts (less than 5%) of titanium or more can produce a microstructure containing as much as 70% of acicular ferrite.

DTIC

Titanium; High Strength Steels; Ferrites; Microstructure

19980011653 Army Armament Research, Development and Engineering Center, Warheads, Energetics and Combat-Support Armaments Center, Picatinny Arsenal, NJ USA

Analysis of Aerosols Produced During Tests of Tungsten Alloy Kinetic Energy Penetrators

Gold, Kenneth, Army Armament Research, Development and Engineering Center, USA; Oct. 1997; 86p; In English

Report No.(s): AD-A331720; ARWEC-TR-97014; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Kinetic energy (KE) penetrators made with tungsten alloys have historically been assumed to be relatively benign and to pose no health or environmental risks. No actual test data has ever been recorded to support this assumption. The assumption is based on the belief that, though a heavy metal, the tungsten constituent of the alloy is non-toxic. However, the presence of two toxic metals, nickel and cobalt, although in relatively small proportions, raises issues about the possible risks that may be associated with (a) inhalation of aerosols and (b) ingestion of the metals once they are introduced into the food chain. This study was designed to characterize the sizes and shapes of tungsten alloy aerosol particles and fragments ejected from penetration tunnels during performance tests of KE penetrators. Special attention was directed to the elemental composition of particles in the respirable size range, the fraction of the aerosol most likely to reach the gas exchange region in the lungs. Dust particles and fragments were also examined in anticipation of performing solubility tests on the residues.

DTIC

Aerosols; Tungsten Alloys; Fragments

19980011667 Army Research Lab., Aberdeen Proving Ground, MD USA

Modeling Dynamic Behavior and Texture Evolution in Pure Tantalum (Ta) Final Report, Apr. - Sep. 1995

Schoenfeld, S. E., Clemson Univ., USA; Ahzi, S., Clemson Univ., USA; Vecchio, K. S., California Univ., USA; Oct. 1997; 32p; In English

Report No.(s): AD-A332819; ARL-TR-1530; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order to model high strain rate deformation and texture evolution in commercially pure tantalum (Ta), description for the thermal elastic viscoplastic behavior of Ta single crystals is considered along with an associated polycrystal averaging scheme. The description incorporates a temperature dependent model for pencil glide on the planes of maximum resolved shear stress. Calculated stress strain data and texture evolution for this model are compared to those of a restricted glide model and to experimental data.

DTIC

Dynamic Characteristics; Polycrystals; Shear Stress; Single Crystals; Stress-Strain Relationships; Temperature Dependence; Temperature Effects; Viscoplasticity

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials. For composite materials see 24 Composite Materials.

19980009137 Case Western Reserve Univ., Cleveland, OH USA

Thermal Relaxation Processes and Stability in Poled Electro-Optic Polymers *Final Report, 1 Apr. 1993 - 31 Mar. 1997*

Singer, Kenneth D., Case Western Reserve Univ., USA; Aug. 1997; 77p; In English

Contract(s)/Grant(s): F49620-93-I-0202; AF Proj. 2303

Report No.(s): AD-A329665; Rept-342-4775; AFOSR-TR-97-0430; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The goal of gaining better understanding of the orientational decay mechanisms of poled nonlinear optical polymers and to develop a predictive description of the long time scale decay was well met. We developed a new experimental technique based on electric field induced second harmonic generation in the frequency domain to probe the polymer over many decades of time. This technique is best applied near the glass transition to probe frequencies from mHz to tens of kHz. We used this technique along with others to study a variety of polymers. Applying an Adams-Gibb model to the temperature dependence of the characteristic frequency, prediction of long term behavior at any temperature based on quick measurements near the glass transition temperature is possible. We also developed a new ultrafast laser source for studying nonlinear optical susceptibilities, and contributed to the study of cross-linked polyimide materials as stable and processable hosts for poled electro-optic polymers.

DTIC

Nonlinear Optics; Electro-Optics; Thermal Stability; Polymeric Films

19980009141 Centre d'Etudes de Grenoble, Lab. d'Electronique et d'Instrumentation, Grenoble, France

Ultra thin buried oxide layers formed by low dose Simox process

Aspar, B., Centre d'Etudes de Grenoble, France; Pudda, C., Centre d'Etudes de Grenoble, France; Papon, A. M., Centre d'Etudes de Grenoble, France; AubertonHerve, A. J., SOITEC S.A., France; Lamure, J. M., SOITEC S.A., France; 1994; 2p; In English; International Conference on Silicon Materials Science and Technology, 22-27 May 1994, San Francisco, CA, USA

Report No.(s): CEA-CONF-12137; CONF-940537; DE97-620251; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Oxygen low dose implantation is studied for two implantation energies. For 190 keV, a continuous buried oxide layer is obtained with a high dislocation density in the top silicon layer due to SiO₂ precipitates. For 120 keV, this silicon layer is free of SiO₂ precipitate and has a low dislocation density. Low density of pin-holes is observed in the buried oxide. The influence of silicon islands in the buried oxide on the breakdown electric fields is discussed.

DOE

Silicon Dioxide; Oxygen; Ion Implantation; Barrier Layers

19980009151 NERAC, Inc., Tolland, CT USA

Polymer Electroluminescence: Technology and Applications. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-858121; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development, use, and performance of polymer electroluminescence technology. Citations reference conjugated polymers, photoregenerated processes, carrier tunneling, quantum efficiency, emission enhancement, and color control. Topics cover exciton dynamics, carrier confinement, and photo-oxidation. Applications include light-emitting diodes, Schottky diodes, flat panel displays, and large screen displays.

NTIS

Bibliographies; Electroluminescence; Product Development; Performance Prediction; Technologies; Conducting Polymers

19980009220 NERAC, Inc., Tolland, CT USA

Vinylidene Fluoride Polymers and Copolymers: Ferroelectrical and Electrical Properties. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865233; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning electrical Properties of Vinylidene Fluoride Polymers (PVDF) and copolymers with an emphasis on ferroelectricity. The citations examine crystallinity and characterization by calorimetry and spectroscopy to determine electrical qualities of PVDF blends. Topics also include dielectric polarization, ferroelectric polarization switching, temperature and pressure dependence on electrical response, and anisotropic behavior. Piezoelectric and pyroelectric properties and applications are discussed in separate bibliographies.

NTIS

Bibliographies; Electrical Properties; Ferroelectricity; Vinylidene

19980009245 NERAC, Inc., Tolland, CT USA

Corrosion and Weather Resistant Polyurethane Coatings (Latest Citations from World Surface Coatings Abstracts)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-869110; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the formulation, applications, and performance of polyurethane-based coatings used to combat corrosion and weathering. Pretreatment methods and applications are reviewed. Use on pipelines, steel tanks, and galvanized steel is described, and marine and bridge applications are examined. Durability of the coating and protection it provides from corrosion and weathering are evaluated. Selected patents are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Protective Coatings; Corrosion Resistance; Polyurethane Resins; Weatherproofing

19980009261 National Inst. of Standards and Technology, Gaithersburg, MD USA

Polymer Film Applied to Glass: Effectiveness at Mitigating Damage from Flying Glass Due to Explosions

Gilman, J. W., National Inst. of Standards and Technology, USA; Simiu, E., National Inst. of Standards and Technology, USA; Jan. 1996; 18p; In English

Report No.(s): PB97-140586; NISTIR-5779; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The General Services Administration (GSA) requested the National Institute of Standards and Technology's (NIST) Building and Fire Research Laboratory (BFRL) to search pertinent English language bibliographic databases for research reports, test data, or other available information in the literature on polymer film applied to monolithic glass. The scope of the literature search include: (1) blast effects on architectural glass; (2) performance of polymeric film on glass under blast conditions; and (3) the application, durability, and maintainability of polymeric films on glass.

NTIS

Polymeric Films; Durability; Data Bases; Maintainability; Explosions

19980009326 NERAC, Inc., Tolland, CT USA

Cermets: Fabrication and Applications. (Latest Citations from the Ei Compendex*Plus Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866645; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the fabrication, properties, and applications of cermets. Properties of interest include hardness, electrical conductivity characteristics and resistance to high temperature and oxidation, abrasion, and impact. Applications include electrical contacts and resistors, cutters, armor, electronic components, magnetic devices, and mechanical components, such as turbine blades.

NTIS

Bibliographies; Cermets; Fabrication; Electrical Resistivity; Hardness

19980009330 Sandia National Labs., Albuquerque, NM USA

Engineered monodisperse mesoporous materials

Saunders, R. S., Sandia National Labs., USA; Small, J. H., Sandia National Labs., USA; Lagasse, R. R., Sandia National Labs., USA; Schroeder, J. L., Sandia National Labs., USA; Jamison, G. M., Sandia National Labs., USA; Aug. 1997; 38p; In English
Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-2027; DE97-009202; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Porous materials technology has developed products with a wide variety of pore sizes ranging from 1 angstrom to 100's of microns and beyond. Beyond 15 angstrom it becomes difficult to obtain well ordered, monodisperse pores. In this report the authors describe efforts in making novel porous material having monodisperse, controllable pore sizes spanning the mesoporous range (20-500 angstrom). They set forth to achieve this by using unique properties associated with block copolymers - two linear homopolymers attached at their ends. Block copolymers phase separate into monodisperse mesophases. They desired to selectively remove one of the phases and leave the other behind, giving the uniform monodisperse pores. to try to achieve this the authors used ring-opening metathesis polymerization to make the block copolymers. They synthesized a wide variety of monomers and surveyed their polymers by TGA, with the idea that one phase could be made thermally labile while the other phase would be thermally stable. In the precipitated and sol-gel processed materials, they determined by porosimetry measurements that micropores, mesopores, and macropores were created. In the film processed sample there was not much porosity present. They moved to a new system that required much lower thermal treatments to thermally remove over 90% of the labile phase. Film casting followed by thermal treatment and solvent extraction produced the desired monodisperse materials (based solely on SEM results). Modeling using Density Functional Theory was also incorporated into this project. The modeling was able to predict accurately the domain size and spacing vs. molecular weight for a model system, as well as accurate interfacial thicknesses.

DOE

Porous Materials; Porosity; Synthesis (Chemistry)

19980009514 Institute of Gas Technology, Des Plaines, IL USA

Test and Evaluation of a Service Connection Method for Low-Pressure CIP Lined Mains *Topical Report, Apr. 1996 - Jun. 1997*

Huebler, J. E., Institute of Gas Technology, USA; Tamosaitis, V., Institute of Gas Technology, USA; Jul. 1997; 23p; In English Report No.(s): PB97-199541; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The U.S. gas distribution industry is looking for cost effective techniques to extend the useful life of buried gas services and save substantial rehabilitation costs. Cured-in-place liners developed in Europe and Japan have the potential to meet these objectives. One concern slowing the acceptance of CIP technology by U.S. gas utilities is potential for tracking or the migration of gas between the CIP liner and the existing pipe wall when the CIP liner is not perfectly bonded to the pipe wall creating a space for gas to migrate. Tracking requires an entry point for the gas into a disbonded area. Cutting a hole in the liner to tie-in an existing or new gas service is a potential entry point for gas. A fitting that prevents tracking at the service connection independent of the quality of adhesion of the liner and pipe wall should increase the use of CIP lining methods. Fitness-for-purpose screening tests, including thermal cycling, have shown that the 'resin sealing method' is effective at preventing tracking at low-pressures. The procedure for apply this method, the screening tests, and the test results are given in this report. Other fittings are being tested to meet the high-pressure applications.

NTIS

Adhesion; Debonding (Materials); Cost Effectiveness; Pipes (Tubes); Sealing; Resins; Thermal Cycling Tests; Low Pressure

19980009519 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Exciplex Emission in Heterojunctions of Poly (pyridyl vinylene phenylene vinylene)s and Poly (vinyl carbazole)

Gebler, D. D., Ohio State Univ., USA; Wang, Y. Z., Ohio State Univ., USA; Jessen, S. W., Ohio State Univ., USA; Blatchford, J. W., Ohio State Univ., USA; Macdiarmid, A. G., Ohio State Univ., USA; Sep. 20, 1997; 6p; In English Contract(s)/Grant(s): N00014-95-I-0302; N00014-92-J-1369

Report No.(s): AD-A330180; TR-P291; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We present photoluminescence and electroluminescence spectra of heterojunctions formed from poly(vinyl carbazole) (PVK) and poly(pyridyl vinylene phenylene vinylene) (PPyVPV). Bilayers of PVK and PPyVPV show a photoluminescence peak which cannot be assigned to either the PVK or the PPyVPV layer. Absorption spectra show that the additional feature results from an exciplex at the bilayer interface. The electroluminescence spectrum from the heterojunctions is due to exciplex emission, with internal efficiencies of approx. 0.1-0.5%.

DTIC

Light Emitting Diodes; Heterojunctions; Emission; Phenyls; Photoluminescence

19980009538 NERAC, Inc., Tolland, CT USA

Ceramic Ferrite Materials. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866561; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theoretical investigations, experimental studies, and applications of ceramic ferrite materials. Topics include preparation, magnetic properties, microstructure, and heat treatment of ferrite materials. Fabrication methods and the characterization of ferrite magnets are also included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Ceramics; Ferrites; Ferrimagnetic Materials

19980009616 NERAC, Inc., Tolland, CT USA

Vinylidene Fluoride Polymers and Copolymers: Pyroelectric and Piezoelectric Properties and Applications. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866843; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning studies of pyroelectrical and piezoelectrical properties of vinylidene fluoride polymers and copolymers, and their applications. Mechanical, chemical, and structural properties are discussed. Citations also explore optimization response, crystallization, poling, aging, films, and sensors. Applications in medical and biological instruments, vibration control, plasma diagnostics, infrared detectors, and micromechanical fabrication are examined. Vinylidene fluoride polymers used as piezoelectric transducers and ferroelectric properties of vinylidene fluoride are covered in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Vinylidene; Copolymers; Bibliographies; Pyroelectricity; Piezoelectricity

19980009619 NERAC, Inc., Tolland, CT USA

Protective Coatings for Stainless Steels. (Latest Citations from METADEX)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865522; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning protective coatings on stainless steels exclusive of electroplating and electro-deposition. Types of protective coatings and application methods discussed include paints, metallic and oxide films, polymeric materials, corrosion inhibitors, passivation techniques, anodization, and vapor deposition. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Protective Coatings; Stainless Steels

19980009620 NERAC, Inc., Tolland, CT USA

Spin-on-Glass. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865548; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development and evaluation of spin-on-glass (SOG) technology. Citations discuss SOG structures, films and layers, sandwiches, and substrates. Applications in semiconductor technology, integrated-circuit manufacture, phase-shifting masks, and optical lithography are examined. References cover techniques of doping, ion implantation, curing, etching, and circuit planarization. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Spin Glass

19980009621 Daresbury Nuclear Physics Lab., UK

Degradation of Poly(vinyl alcohol) Thin Films During Monochromatised XPS: Substrate Effects and X-ray Intensity Dependence

Beamson, G., Daresbury Nuclear Physics Lab., UK; Briggs, D., Siacon Consultants Ltd., UK; Nov. 1997; 20p; In English

Report No.(s): DL-P-97-007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Films of poly(vinyl alcohol), approx. 2 nm thick, on silicon, copper and gold substrates were allowed to degrade for up to 800 minutes during monochromatised Al K-alpha XPS. Initial relative degradation rates of 1: approx. 33: approx. 44 were mea-

sured for the three substrates, consistent with their yield of photoelectrons and secondary electrons. The initial rate of degradation was found to vary linearly with the x-ray intensity.

Author

Polyvinyl Alcohol; Degradation; Polymeric Films; X Rays; Photoelectron Spectroscopy

19980009638 NERAC, Inc., Tolland, CT USA

Plastisols: Compositions and Applications. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866538; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the composition and application of plastisols. Citations cover polyvinyl chloride (PVC), polyvinyl acetals, polyvinyl esters, polyesters, and acrylic polymers, copolymers and blends. Sealants, gaskets, closures, liners, coatings, and shoe insoles are among the applications cited. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Plastisols; Plastics

19980009777 NERAC, Inc., Tolland, CT USA

Solar Collectors: Corrosion Protection and Protective Coatings. (Latest Citations from the Energy Science and Technology Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866892; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning corrosion protection and protective coatings for solar collectors. The citations emphasize aluminum, copper, and iron as the most common solar collector materials. Coatings described include thin film metalized polymers, electrochemically deposited polymer films, and black chrome plating for solar selective absorbers. Use of vacuum processes and spray pyrolysis is also discussed.

NTIS

Corrosion Prevention; Energy Technology; Plating; Protective Coatings; Pyrolysis; Research and Development; Selective Surfaces; Solar Collectors

19980009796 Michigan Univ., Div. of Research Development and Administration, Ann Arbor, MI USA

Net Shape Forming of Tough Fibrous Monolithic Ceramics Final Report, 1 Apr. 1994 - 30 Mar. 1997

Halloran, John W., Michigan Univ., USA; Aug. 25, 1997; 105p; In e

Contract(s)/Grant(s): N00014-94-I-0278

Report No.(s): AD-A329862; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Significant dimensional changes involving linear expansion and shrinkage of 6% occur during heating of a thermoplastic SiC/ethylene vinyl acetate mixture. Thermal expansion occurs before weight loss begins, and can be quantitatively explained in terms of the thermal expansion behavior of the constituents and the crystallization or melting of the semicrystalline polymer. Irreversible anisotropic displacements occur during the first heating cycle due to relaxation of molding strains. These can be reduced by annealing for periods comparable to the viscoelastic relaxation of the ceramic/polymer system. Shrinkage occurs during the early stages of degradation of EVA. This shrinkage is quantitatively accounted for with volume losses resulting from removal of the EVA. Shrinkage continues as weight loss proceeds and stops only at the point the ceramic particles contact one another. Total displacement behavior is the sum of the shrinkage from weight loss plus the expansion from thermal expansion of the individual components, and can be quantitatively predicted for simple or multi-step heating schedules.

DTIC

Ceramic Matrix Composites; Shapes; Ceramics; Thermoplasticity

19980009800 Sandia National Labs., Albuquerque, NM USA

Alumina strength degradation in the elastic regime

Furnish, M. D., Sandia National Labs., USA; Chhabildas, L. C., Sandia National Labs., USA; [1997]; 5p; In English; Meeting of the Topical Group on Shock Compression of Condensed Matter of the American Physical Society, 27 Jul. - 1 Aug. 1997, Amherst, MA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-1946C; CONF-970707-2; DE97-007978; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Measurements of Kanel et. al. [1991] have suggested that deviatoric stresses in glasses shocked to nearly the Hugoniot Elastic limit (HEL) relax over a time span of microseconds after initial loading. Failure (damage) waves have been inferred on the basis of these measurements using time-resolved manganin normal and transverse stress gauges. Additional experiments on glass by other researchers, using time-resolved gauges, high-speed photography and spall strength determinations have also lead to the same conclusions. In the present study the authors have conducted transmitted-wave experiments on high-quality Coors AD995 alumina shocked to roughly 5 and 7 GPa (just below or at the HEL). The material is subsequently reshocked to just above its elastic limit. Results of these experiments do show some evidence of strength degradation in the elastic regime.

DOE

Aluminum Oxides; High Speed Photography; Manganin (Trademark); Measuring Instruments

19980009802 NERAC, Inc., Tolland, CT USA

Cermets: Fabrication and Applications (Latest Citations from the NTIS Bibliographic Database)

May 1996; In English

Report No.(s): PB96-869821; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties and applications of cermets. The synthesis of cermets is discussed. Performance under high temperature, abrasion resistance, and mechanical properties are studied. Applications in electronics, coatings, weapons, and cutting tools are briefly considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Cermets; Fabrication

19980009814 NERAC, Inc., Tolland, CT USA

Powder Processing of Oxides: Latest Citations from Engineered Materials Abstracts

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863006; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties and applications of metal oxide ceramics and refractories. Citations consider cold isostatic pressing, compacting, densification, firing, grinding, hot isostatic pressing, laser beam processing, and sintering. Aluminum oxide, beryllium oxide, hafnium oxide, silicon dioxide, and titanium dioxide are covered. Uses in insulation, propulsion systems, electric devices, and cylinder heads are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Powder Metallurgy; Bibliographies; Refractories; Aluminum Oxides; Beryllium Oxides; Hafnium Oxides; Silicon Dioxide; Titanium Oxides

19980009828 Arizona Univ., Dept. of Materials Science and Engineering, Tucson, AZ USA

Ceramics from Metal-Organic Precursors Final Report, 1 Aug. 1994 - 14 Apr. 1997

Uhlmann, Donald R., Arizona Univ., USA; Sep. 26, 1997; 42p; In English

Contract(s)/Grant(s): F49620-95-I-0011

Report No.(s): AD-A330596; AFOSR-TR-97-0519; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our efforts during the past year, as outlined in the proposal, have been on the improvement in photostability of laser dyes within sol-gel derived hosts through the understanding of the dye/matrix interactions. The efforts of the research program can be best described by the manuscripts that have been or are being published. These manuscripts are included in the present progress report.

DTIC

Organometallic Compounds; Cermets

19980009829 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Photoluminescence in Pyridine-Based Polymers: Role of Aggregates

Blatchford, J. W., Ohio State Univ., USA; Jessen, S. W., Ohio State Univ., USA; Lin, L. B., Ohio State Univ., USA; Gustafson,

T. L., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 12p; In English

Contract(s)/Grant(s): N00014-95-I-0302; N00014-92-J-1369

Report No.(s): AD-A330183; TR-P277; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We present a study of the morphology dependence of the photoluminescence (PL) properties of the pyridine-based polymers poly(p-pyridine), and poly(p-pyridyl) vinylene p-phenylene vinylene (PPyVPV). The photoluminescence of solution samples is characterized by high quantum efficiency (greater than 70% in PPyVPV), weak coupling to vibrational modes (Huang-Rhys parameter 0.5) and a single-exponential decay (radiative lifetime 1 ns). On the other hand, film samples display strongly red-shifted, featureless emission with low quantum yield (less than 20%) and highly nonexponential decay dynamics. Through consideration of absorption and excitation spectra, the 'site-selectivity' of the PL, and the concentration dependence of the PL spectrum, we demonstrate that the redshifted film spectra are a result of the formation of low-energy aggregate sites due to strong interchain interactions. Time-resolved measurements suggest a longer radiative lifetime for the aggregate vs. solution, leading to the lower efficiency. Aggregate formation is found to be morphology dependent, and is minimal in 'powder' samples which are precipitated after polymerization.

DTIC

Photoluminescence; Morphology; Aggregates; Research

19980009872 California Univ., Dept. of Chemistry, Riverside, CA USA

Ultrafast Photochromic Sol-Gel Glasses and Fiber Optic Sensors *Final Report, 15 Sep. 1992 - 14 Sep. 1996*

Chronister, Eric L., California Univ., USA; Aug. 21, 1997; 26p; In English

Contract(s)/Grant(s): DAAL03-92-G-0399

Report No.(s): AD-A332537; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Organically doped sol-gel glasses have been investigated as fast response photochromic materials and as novel cladding materials for intrinsic fiber-optic chemical sensors. The following investigations are discussed: (1) Time-resolved spectroscopic measurements of fast optical energy transfer and trapping in organically doped glasses as a probe of the spatial distribution of chromophores within porous sol-gel matrices; (2) Picosecond photon echo measurements of homogeneous dephasing have been utilized as a probe of chromophore-host interactions; (3) Neutron diffraction measurements (small angle and quasi elastic) have been utilized to probe the local pore structure of sol-gel matrices; (4) Optical limiting based on fast photophysical processes in organic chromophores doped in sol-gel hosts; and (5) Time-resolved detection of intrinsic sol-gel clad fiber-optic chemical sensors. Optical energy transfer in organically doped sol-gel glasses have been investigated by time-resolved fluorescence depolarization measurements and analyzed in terms of the spatial distribution of chromophores in porous xerogel glasses. Picosecond photon echo measurements of the temperature dependent homogeneous dephasing rate of organically doped inorganic sol-gel glasses have probed irreversible low frequency dynamics of the sol-gel environment. And, intrinsic sol-gel clad fiber-optic chemical sensors have been demonstrated utilizing time-resolved optical detection of multiplexed sensors along fiber-optic waveguides.

DTIC

Fiber Optics; Photochromism; Low Frequencies; Measuring Instruments

19980009883 NERAC, Inc., Tolland, CT USA

Automotive Fabrics: Nonwovens. (Latest Citations from World Textile Abstracts)

Mar. 1996; In English

Report No.(s): PB96-866223; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning nonwoven fabrics used in the automotive industry. Articles discuss nonwovens for automotive upholstery, moldings, carpeting, noise control, other interior applications, engine cowlings, gasketing, and filtration. Citations address materials, properties, flame-resistance, chemical-resistance, manufacturing processes, and new product introductions.

NTIS

Bibliographies; Noise Reduction; Manufacturing; Woven Composites; Industries; Mechanization

19980009888 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Pyridine Based Polymer Light-Emitting Devices

Wang, Y. Z., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Fu, D. K., Ohio State Univ., USA; Swager, T. M., Ohio State Univ., USA; Macdiarmid, A. G., Ohio State Univ., USA; Sep. 20, 1997; 13p; In English

Contract(s)/Grant(s): N00014-95-I-0302; N00014-92-J-1369

Report No.(s): AD-A330184; TR-P295; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Pyridine-based conjugated polymers and copolymers have been shown to be excellent candidates for polymer light-emitting devices in various device configurations. The high electron affinity of pyridine based polymers enables the use of relatively stable metals such as Al as an electron injecting contact. Taking advantage of the better electron transport properties of the pyridine-containing polymers, we fabricate bilayer devices utilizing poly(9-vinyl carbazole) (PVK) as a hole transporting/electron blocking layer. This improves the device efficiency and brightness significantly due to the charge confinement and exciplex emission at the PVK/emitting polymer interface. The incorporation of conducting polyaniline network electrode into PVK reduces the device turn on voltage significantly while maintaining the high quantum efficiency, thus improving the device power efficiency. Novel device configurations such as symmetrically configured AC light-emitting (SCALE) devices enable the device to work under both forward and reverse bias as well as in AC modes, potentially improving the device stability.

DTIC

Light Emitting Diodes; Emittance; Light Emission; Ferroelectric Materials; Electric Potential; Electron Transfer

19980009900 NERAC, Inc., Tolland, CT USA

Plastisols: Formulations. (Latest Citations from the Rubber and Plastics Research Association Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865209; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the manufacture, properties, methods of application, and use of plastisols. Formulations are examined relative to various resins, fillers, stabilizers, plasticizers, characteristics, and applications. Methods and machinery for mixing, coloring, molding, and curing plastisols are considered.

NTIS

Data Bases; Fillers; Plasticizers; Plastics; Plastisols; Resins; Rubber

19980009995 Harvard Univ., Cambridge, MA USA

A Facility for the Attribute-Based Vapor Phase Processing of Multilayers and Coatings Final Report, 26 Jun. 1995 - 25 Jun. 1996

Evans, Anthony G., Harvard Univ., USA; Jun. 26, 1997; 18p; In English

Contract(s)/Grant(s): N00014-95-I-1098

Report No.(s): AD-A330747; Rept-44-721-7323-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An electron beam deposition system suitable for the intelligent processing of oxide films and coatings has been designed and constructed. The three major features include (1) a heated substrate with a rotating stage (2) magnetically rastered e-beam dual sources, (3) four sub-systems for measuring film properties either in situ or post situ. The latter include: (a) an infrared imaging system, (b) a beam curvature apparatus for stress measurement, (c) an atomic force microscope to quantify topography. The system is being applied to oxide films relevant to thermal barrier applications (notably ZrO₂) as well as alumina, yttria and other oxides suitable for oxidation protection. The deposited films are being subject to a measurement protocol that determines their residual strain state, their fracture toughness and their adhesion to alloy substrates.

DTIC

Vapor Deposition; Protective Coatings; Electron Beams; Topography; Fracture Strength; Oxide Films; Substrates; Vapor Phases

19980009997 Pennsylvania State Univ., Applied Research Lab., University Park, PA USA

Development and Evaluation of Environmentally Friendly and Performance Enhanced Lubricants for Marine Applications

Adams, Ryan B., Pennsylvania State Univ., USA; Perez, Joseph M., Pennsylvania State Univ., USA; Conway, Joseph C., Pennsylvania State Univ., USA; Sep. 1997; 152p; In English

Report No.(s): AD-A330727; TR-97-006; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

There are many properties of a lubricant which can influence its performance. In order to improve on a lubricant, the application within which the lubricant will be used must be considered to determine which properties are the most crucial. This work has focused on two lubricants, an oil and a grease, which are for use in different marine applications. Improving on the wear performance of both lubricants was a priority in order to improve on the lifetime of these marine systems. Another motivation, particularly for the oil, was to make the new lubricant more environmentally friendly than the currently used mineral oil. The base fluid for the oil lubricant was chosen to be a polyalkylene glycol based on previous work. The oil would need to be insoluble in water which limited the choice to polypropylene glycols. Additives were evaluated on several bench tests to improve performance prop-

erties as needed. The main properties investigated include: wear protection on steel, aluminum, nickel aluminum bronze and manganese bronze systems, foaming tendency and oxidation properties.

DTIC

Lubricants; Environment Effects; Performance Tests

19980010045 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Electrically Conducting Polymers: Science and Technology

Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 28p; In English

Contract(s)/Grant(s): N00014-95-I-0302

Report No.(s): AD-A330165; P312; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The electrical conductivities of the intrinsically conducting polymer systems now range from that typical of insulators to that typical of semiconductors such as silicon (-10-5 S/cm) to greater than 10(4) S/cm (nearly that of a good metal such as copper, 5 x 10(5) S/cm). The origin of the conductivity in these polymers is reviewed. Applications of these polymers, especially polyanilines, have begun to emerge. These include coatings and blends for electrostatic dissipation and electromagnetic interference (EMI) shielding, electromagnetic radiation absorbers for welding (joining) of plastics, conductive layers for light-emitting polymer devices, and anticorrosion coatings for iron and steel.

DTIC

Conducting Polymers; Conductivity; Corrosion Resistance; Electromagnetic Interference; Electromagnetic Radiation; Electrostatics

19980010102 Selee Corp., Hendersonville, NC USA

Application of Reticulated Ceramic Foam to Radiant Burners, Volume 1

Haack, D., Selee Corp., USA; May 1997; 152p; In English

Report No.(s): PB98-108525; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A flashback resistant ported tile/ceramic foam radiant burner was developed. Performance characterization determined that the burner emits infrared radiation highly efficiently and produces low levels of pollutant emissions (carbon monoxide and nitrogen oxides). The importance of ceramic foam emissivity on burner performance was identified. An improved ceramic foam radiant layer material was developed through an experimental program. Durability enhancement of as much as three times that of the original material was demonstrated. Advanced ceramic foam materials were also investigated in this program and demonstrated radiant burner lifetime in excess of 5000 cyclic hours (on-going at the conclusion of this program). Applications of ceramic foam in natural gas related industry were investigated. Customer feedback aided in the performance of experimental programs to investigate these concepts.

NTIS

Boilers; Burners; Ceramics; Foams

19980010103 Selee Corp., Hendersonville, NC USA

Application of Reticulated Ceramic Foam to Radiant Burners, Volume 2 Final Report

Haack, D., Selee Corp., USA; May 1997; 197p; In English

Report No.(s): PB98-108533; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

A flashback resistant ported tile/ceramic foam radiant burner was developed. Performance characterization determined that the burner emits infrared radiation highly efficiently and produces low levels of pollutant emissions (carbon monoxide and nitrogen oxides). The importance of ceramic foam emissivity on burner performance was identified. An improved ceramic foam radiant layer material was developed through an experimental program. Durability enhancement of as much as three times that of the original material was demonstrated. Advanced ceramic foam materials were also investigated in this program and demonstrated radiant burner lifetime in excess of 5000 cyclic hours (on-going at the conclusion of this program). Applications of ceramic foam in natural gas related industry were investigated. Customer feedback aided in the performance of experimental programs to investigate these concepts.

NTIS

Boilers; Burners; Foams; Ceramics

19980010109 NERAC, Inc., Tolland, CT USA

Thermal Spray Ceramic Coatings: Latest Citations from METADEX

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862784; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the application of ceramic coatings by thermal spraying. The coatings discussed include alumina, yttrium oxide, carbides, and nitrides. Citations focus on plasma spraying, tribology, processing, and contact fatigue.

NTIS

Bibliographies; Ceramic Coatings; Thermal Boundary Layer; Plasma Spraying

19980010191 NASA Marshall Space Flight Center, Huntsville, AL USA

Oxygen Systems Cleaners for Aerospace Applications

Davis, Samuel E., NASA Marshall Space Flight Center, USA; Lowery, Freida, NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 49-57; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

New environmental regulations have forced extensive evaluations of many different cleaning agents for use in oxygen systems. This is no simple process because pure oxygen is a very strong oxidizer, and when placed in contact with a foreign substance, the combination may be explosive. This foreign substance can easily be a cleaning agent residue left over in the oxygen system after cleaning. This paper focuses on the factors that must be considered when selecting a cleaning agent for oxygen systems, as well as the approval processes which are currently being utilized by NASA for oxygen compatibility of materials. This paper will provide a working description of how to begin selecting a cleaning agent for oxygen systems. The paper will present the following: Background information on the necessity of a stringent selection process for oxygen system cleaners; Specifications and regulations concerning cleaning for oxygen service; Changing oxygen cleaning specifications given current environmental concerns; Testing for cleanliness in oxygen systems, Cleaning agents that have been tested for oxygen systems, including an extensive list of some of the newer 'environmentally friendly' cleaning agents; and Test results and conclusions from the testing. The paper will also provide instructions on the proper procedures for obtaining NASA approval on a candidate oxygen systems cleaning agent.

Author

Cleaners; Oxygen Supply Equipment; Chemical Cleaning; Environment Effects; Alternatives; Performance Tests

19980010192 Pratt and Whitney Aircraft, Government Engines and Space Propulsion, West Palm Beach, FL USA

Elimination of Chlorinated Solvents and Other Hazardous Materials in the Manufacture of High Pressure Liquid Oxygen SSME Turbopumps

Privett, Mal, Pratt and Whitney Aircraft, USA; Hodgens, Henry, Pratt and Whitney Aircraft, USA; Gehron, Mike, Pratt and Whitney Aircraft, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 59-64; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Pratt & Whitney is developing alternatives to trichloroethylene in precision cleaning and verification operations for the manufacture of high pressure Turbopumps for the SSME program. Although the elimination of ODC materials has been accomplished with the elimination of 1,1,1 Trichloroethane and Freon 113, there is significant additional pressure to eliminate the trichloroethylene due to regulatory reporting and costs as well as corporate environmental goals. Pratt & Whitney (P&W) is pursuing both an aqueous precision cleaning operation and a high pressure liquid carbon dioxide precision cleaning method to totally replace the degreasing operation presently used. The liquid CO₂ unit is being evaluated to permit an integral non volatile residue (NVR) analyzer with the unit. Alternative verification methods to the present chlorinated solvents are being investigated. In addition, P&W is eliminating all hexavalent chromium materials used on the pumps in applications such as scaling of anodized surfaces. P&W is also working to implement a low VOC, water based maskant for plating and chemical milling operations.

Author

Turbine Pumps; Hazardous Materials; Carbon Dioxide; Chemical Cleaning; Environment Effects; Alternatives; Cleaners; Trichloroethylene

19980010193 Pennsylvania State Univ., The Applied Research Lab., State College, PA USA

Supercritical Fluid Cleaning of Oxygen Service Instrumentation

Peters, Jonathan A., Pennsylvania State Univ., USA; Phelps, Max R., Pacific Northwest Lab., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 65-74; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The Montreal Protocol incorporates a ban on the production of a number of chemicals that have historically been used for cleaning and degreasing operations. Bourdon tube pressure gauges for oxygen service are an example of a component that requires a high degree of cleanliness but is not adequately cleaned by conventional alternative solvents such as water-based formulations. Supercritical fluid cleaning appears to offer a solution to this problem. Simulated bourdon tubes were filled with 2190 TEP lubricant in order to represent a worst-case contamination scenario. Supercritical carbon dioxide (SCCO₂) was used to remove 97% of this material in a five minute cleaning cycle. Preliminary results are promising and further tests are underway to qualify this process for cleaning actual oxygen service gauges.

Author

Supercritical Fluids; Oxygen Supply Equipment; Chemical Cleaning; Environment Effects; Cleaners; Solvents; Carbon Dioxide; Bourdon Tubes

19980010194 Dow Corning Corp., Midland, MI USA

New Technologies and Cleaning Performance Based on Volatile Methyl Siloxanes

Cull, Ray A., Dow Corning Corp., USA; Swanson, Stephen, Dow Corning Corp., USA; Bryant, Donovan, Dow Corning Corp., USA; Moore, John, Dow Corning Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 75-83; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Linear volatile Methyl siloxanes (VMS) are a new class of solvents that are VOC exempt, non ozone depleting, SNAP approved, are not hazardous air pollutants, and have negligible global warming potential due to their less than 30 day atmospheric lifetimes. Based on their favorable environmental qualities, linear VMS are the #1 preferred cleaning materials for substrate cleaning, precision cleaning, and electronics cleaning by the California South Coast Air Quality Management District. They have negligible odor, very low viscosity, low surface tension, good toxicology properties, and 100% evaporation for effective cleaning, drying, and rinsing. Ultra high purity versions of these products have been commercialized that have very low nonvolatile residue, making them suitable for operations involving secondary bonding and painting. Straight VMS will clean non polar contaminants including silicone residue, greases, and oils. These materials will also soften, greatly swell and lift many cured silicones, allowing easy removal, as well as removing any remaining residue. This allows bonding of organic adhesives and paints to surfaces previously covered by silicone. New azeotrope formulations have been developed which enable the cleaning of rosin flux from circuit boards, and liquid crystal display residue, and optics cleaning.

Author

Siloxanes; Chemical Cleaning; Environment Effects; Alternatives; Product Development; Cleaners; Methyl Compounds

19980010195 Lockheed Martin Corp., Manned Space Systems, Huntsville, AL USA

Experimental Strategies in the Development of a Polyisocyanurate Foam Insulation With HCFC 141b Blowing Agent

Blevins, Elana, Lockheed Martin Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 85-92; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The MSFC TPS Materials Research Laboratory has utilized statistical techniques in the design of experiments to develop an insulation that meets the requirements for usage on the External Tank of the Space Shuttle. This insulation with an average density of 2.15 lb/cu ft is foamed with the environmentally friendly blowing agent HCFC 141b. HCFC 141b has an ozone depletion potential that is approximately one tenth that of the previous blowing agent CFC 11, but the thermodynamic properties of HCFC 141b affect the reaction kinetics and material properties. Statistically based experiments were designed to optimize the formulation for maximum mechanical strength at cryogenic temperatures with a minimum foam density. The experimental approach, chemistry, processing, and foam properties are described.

Author

Insulation; External Tanks; Space Shuttles; Environment Effects; Cyanurates; Foams; Statistical Analysis; Thermodynamic Properties; Blowing

19980010196 Lockheed Martin Corp., Manned Space Systems, Huntsville, AL USA

Evaluation of Polyurethane Foam Insulation: Blowing Agents With Zero Ozone Depletion Potential

Sharpe, Jon, Lockheed Martin Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 93-97; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The MSFC Thermal Protection Systems (TPS) Materials Research Laboratory is currently investigating environmentally friendly blowing agents for use in the insulations of the Space Shuttle's External Tank. The original TPS foam materials of the External Tank were blown with chlorofluorocarbon (CFC) 11 that is now regulated because of its high Ozone Depletion Potential (ODP). Hydrochlorofluorocarbons (HCFCs), with an ODP that is one tenth that of CFCs, have been widely adopted as an interim blowing agent in urethane insulations. In FY96, Lockheed Martin completed the production qualification and validation of HCFC

14 lb blown insulations. Due to the expected limited commercial lifetime of HCFC 141b, research efforts are underway to identify and develop alternatives with zero ozone depletion potential. Physical blowing agents identified have included hydrocarbons, fluorocarbons, fluoroiodocarbons, hydrofluoroethers, and more predominantly, hydrofluorocarbons (HFCs). This paper will describe results from a research program with candidate HFC blowing agents.

Author

Polyurethane Foam; Insulation; Thermal Protection; External Tanks; Blowing; Environment Effects; Alternatives; Ozone Depletion; Urethanes

19980010197 Lockheed Martin Corp., Manned Space Systems, Huntsville, AL USA

A Tooling Foam With Zero Ozone Depletion Potential For Composites Fabrication

MacArthur, Doug, Lockheed Martin Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 99-107; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The MSFC TPS Materials Research Laboratory has developed a tooling foam for use in composites processing with mechanical and thermal properties superior to those of commercially available materials. MARCORE(TM) is a urethane modified polyisocyanurate foam system blown with an environmentally friendly blowing agent with zero ozone depletion potential. The patented material has the advantages of rapid prototyping, processing with unlimited cross sectional area, and compatibility with most pre-impregnated composite resins and their associated cure cycles. The tooling foam is dimensionally stable at temperatures above 250 F and can withstand pressures greater than 100 psi. The chemistry, liquid properties, material properties, and applications are presented.

Author

Foams; Cyanurates; Fabrication; Environment Effects; Alternatives; Composite Materials; Blowing; Synthesis (Chemistry)

19980010200 TRW Environmental Services, Redondo Beach, CA USA

Solar Cell Assembly Defluxing Using Ozone Depleting Chemical Replacements

McInyre, Lori J., TRW Environmental Services, USA; Lempka, Robert, TRW Environmental Services, USA; Main, Diane, TRW Environmental Services, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 117-126; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Studies to identify trichlorotrifluoroethane (Freon TF - used at TRW in alcohol & stabilizer mixture formulations such as Freon TES and Genesolv DES) replacement cleaning agents for solar cell defluxing applications have been ongoing at TRW since 1992. Though initial studies identified some promising aqueous and semi-aqueous cleaning agents, they were eliminated as replacement candidates in 1994 due to process control, substrate corrosion, and manufacturing floor space concerns. All scale-up testing since 1994 has concentrated on warm (60 C) isopropyl alcohol (IPA), hydrochlorofluorocarbon (HCFC) (AK-225), and hydrofluorocarbon (HFC) (Vertrel SMT, an azeotrope of Vertrel XF HFC and dichloroethylene) technologies as replacement candidates for solar array manufacturing applications. Based on the results of the scale-up test efforts, the SMT and pure AK-225 materials cleaned as well as the existing process, but both materials attacked the substrate's silicone solar cell-to-coverglass bond region more aggressively than the existing Freon TF based cleaning agents. The AK-225AES (an azeotrope of AK-225, ethanol and stabilizer) material was identified as a drop in replacement for the existing process, however this HCFC will only see limited implementation because of its production cut-off date in the year 2015, high cost, and increased health risk (50 ppm Threshold Limit Value) compared to the Freon TF (1000 ppm Threshold Limit Value). The warm IPA spray process, on the other hand, cleans as well as the existing process yet appears to less aggressively attack the silicone bond region of the solar cells than the SMT, AK-225, AK-225AES or existing Freon TF mixtures. Based on laboratory tests, the selected IPA process will out-perform the present cleaning process, but IPA's flammability rating (Class IB) introduces new safety concerns that were not an issue in the past and do not need to be addressed with the HCFC and HFC products. At a cost of approximately \$400,000, TRW has purchased custom designed equipment and is making the necessary facility modifications to safely handle the new IPA spray process for solar cell module strings up to 2 x 4 feet in dimension. The new equipment is scheduled to be operating in November of 1996, and AK-225AES is presently under evaluation as an intermediate replacement should the IPA system implementation schedule slips outside of TRW's Freon TF use schedule. In addition, a smaller degreaser with AK-225AES is presently under consideration as a temporary replacement cleaning agent for solar cell defluxing operations prior to coverglass bonding, and additional IPA capital equipment will be evaluated in 1997 as the long term replacement for the precoverglass cleaning operation.

Author

Cleaners; Environment Effects; Solar Cells; Chemical Cleaning; Alternatives; Chlorofluoromethane; Fluxes

19980010202 Thiokol Corp., Brigham City, UT USA

Program Development for an Aqueous Cleaning System

Sagers, Neil, Thiokol Corp., USA; Evans, Kurt, Thiokol Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 137-144; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Process parameters, bath life tests, scale-up parameters, and disposal in municipal water treatment systems were determined for an aqueous cleaner, Brulin 1990GD(R). The aqueous cleaner had been selected for cleaning space shuttle reusable solid rocket motor (RSRM) components through a battery of screening tests. Optimized process conditions were determined with a designed experiment program. It was estimated that the cleaner would clean approximately 2.7 RSRM motors with grease and over 10 RSRMs without grease. The cleaner performed well with the adhesives tested and small variations in cleaner concentration did not significantly increase the presence of residual contaminants on test surfaces. Scale-up parameters provided for both small parts and large RSRM components showed that approximately 10 gal/ft(exp 2) of cleaner solution is required to remove grease. Biodegradation tests showed that the cleaner was acceptable in a municipal-type waste water treatment facility.

Author

Solid Propellant Rocket Engines; Chemical Cleaning; Environment Effects; Cleaners; Performance Tests

19980010203 McDonnell-Douglas Aerospace, Huntington Beach, CA USA

Aqueous Tube Cleaning Advances at McDonnell Douglas Aerospace

Adam, S. J., McDonnell-Douglas Aerospace, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 145-154; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

McDonnell Douglas Aerospace produces tubing for a variety of aerospace uses. Typically these tubes, made from aluminum, stainless steel, and titanium range from 1/4" to 6" in diameter, with lengths up to 40 feet. Prior to 1996, tube bending lubricants were removed using 1,1,1 trichloroethane in a vapor degreaser to flush the tubing. Because of the 1996 deadline for the phase-out of ozone depleting substances (ODC's), an aqueous tube cleaning system was developed using a tank immersion system, which was later changed to an enclosed cabinet system. The design change from the tank system to the enclosed cabinet system provided a savings of \$500,000. The enclosed cabinet system operates by connecting tubing to a manifold located inside of the cabinet. Aqueous cleaning solutions are then pumped from enclosed tanks through the tubes at high velocities, and are also sprayed on the outside of the tubes inside the cabinet. The solution then drains through the bottom of the cabinet back to the tank. The cleaning process uses hot water as a pre-rinse, a hot aqueous cleaning solution, hot deionized water as an initial rinse and a final rinse, and a drying stage with warm purified air. Between cycles, clean compressed air purges the remaining solution out of the tubes to prevent solution cross contamination. This system takes operator error out of the tube cleaning procedure. The operator simply loads the tubing into the washer and removes clean dry tubing when the cycle is complete. This paper discusses: (1) Current tubing configurations and problems, (2) lubricant and cleaner selection considerations, (3) cleanliness level requirements, (4) a comparison between immersion tank and cabinet systems, (5) the performance parameters used in the design process, (6) cabinet system operating sequence, (7) waste treatment, and (8) laboratory test data.

Author

Aqueous Solutions; Pipes (Tubes); Chemical Cleaning; Environment Effects; Cleaners; Alternatives; Lubricants

19980010204 Rockwell International Corp., Rocketdyne, Canoga Park, CA USA

Aqueous Precision Cleaning of Engine Components

Stern, Susan M., Rockwell International Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 155-166; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Prior to 1996, precision cleaning of engine components was performed using 1,1,1-trichloroethane (TCA). Its use was banned at Rocketdyne as of 31 December 1995 due to its classification as an ozone depleting chemical. Conversion to all aqueous cleaning at Rocketdyne has been completed. Precision cleaning is performed in the Aqueous Fine Clean Facility which consists of three ultrasonic tanks two spray rinse tanks and one immersion tank without ultrasonics. The tanks can accommodate hardware up to three feet in each dimension: flushing capabilities exist for larger hardware. A total of nine aqueous precision cleaning processes are available through the pairing of three different process options with three distinct cleaning methods. The process parameters were developed based upon earlier experiments using small test samples. Production hardware from different programs has been processed through the facility and has met particulate and nonvolatile residue (NVR) cleanliness requirements. These results demonstrate aqueous precision cleaning to be as effective as the previous TCA method.

Author

Engine Parts; Chemical Cleaning; Environment Effects; Cleaners; Chlorine Compounds; Ethane; Aqueous Solutions; Methodology

19980010205 Thiokol Corp., Brigham City, UT USA

Substitution of Spray-in-Air Aqueous Cleaning for TCA Degreasing of Space Shuttle Reusable Solid Rocket Motor Hardware

Wynn, Robert, Thiokol Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 167-173; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Because the Clean Air Act eliminates the production of methyl chloroform for emissive uses after January 1, 1996, the bond surface preparation processes used for the Space Shuttle Reusable Solid Rocket Motor are being changed to eliminate methyl chloroform (TCA) degreasing. Spray-in-air aqueous cleaning, in conjunction with automated cosmetic grit blast, will be used to prepare metal hardware for subsequent bonding operations. The cleaner that has been selected is Brulin 1990 GD(R). An extensive development and qualification effort is being conducted for this change. Testing completed to date with laboratory, mid-scale, and full-scale equipment shows that bond strengths are as good or better than those prepared with TCA vapor degreasing. Full-scale motor and igniter component cleaning tests and witness panel tensile and peel tests have yielded data and practical lessons that verify the equivalence of aqueous cleaning and TCA processing.

Author

Aqueous Solutions; Methyl Compounds; Chloroform; Environment Effects; Substitutes; Cleaning; Cleaners; Sprayers; Solid Propellant Rocket Engines

19980010206 Thiokol Corp., Huntsville Space Office, Huntsville, AL USA

Development of Statistical Process Control Methodology for an Environmentally Compliant Surface Cleaning Process in a Bonding Laboratory

Hutchens, Dale E., Thiokol Corp., USA; Doan, Patrick A., Thiokol Corp., USA; Boothe, Richard E., Thiokol Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 175-183; In English; Also announced as 19980010184 Contract(s)/Grant(s): NAS8-38100; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Bonding labs at both MSFC and the northern Utah production plant prepare bond test specimens which simulate or witness the production of NASA's Reusable Solid Rocket Motor (RSRM). The current process for preparing the bonding surfaces employs 1,1,1-trichloroethane vapor degreasing, which simulates the current RSRM process. Government regulations (e.g., the 1990 Amendments to the Clean Air Act) have mandated a production phase-out of a number of ozone depleting compounds (ODC) including 1,1,1-trichloroethane. In order to comply with these regulations, the RSRM Program is qualifying a spray-in-air (SIA) precision cleaning process using Brulin 1990, an aqueous blend of surfactants. Accordingly, surface preparation prior to bonding process simulation test specimens must reflect the new production cleaning process. The Bonding Lab Statistical Process Control (SPC) program monitors the progress of the lab and its capabilities, as well as certifies the bonding technicians, by periodically preparing D6AC steel tensile adhesion panels with EA-91 3NA epoxy adhesive using a standardized process. SPC methods are then used to ensure the process is statistically in control, thus producing reliable data for bonding studies, and identify any problems which might develop. Since the specimen cleaning process is being changed, new SPC limits must be established. This report summarizes side-by-side testing of D6AC steel tensile adhesion witness panels and tapered double cantilevered beams (TDCBs) using both the current baseline vapor degreasing process and a lab-scale spray-in-air process. A Proceco 26 inches Typhoon dishwasher cleaned both tensile adhesion witness panels and TDCBs in a process which simulates the new production process. The tests were performed six times during 1995, subsequent statistical analysis of the data established new upper control limits (UCL) and lower control limits (LCL). The data also demonstrated that the new process was equivalent to the vapor degreasing process.

Author

Adhesion Tests; Adhesive Bonding; Cleaning; Surface Properties; Sprayers; Statistical Analysis; Epoxy Resins; Metal Surfaces; Cleaners

19980010207 NASA White Sands Test Facility, NM USA

Replacement Technologies for Precision Cleaning of Aerospace Hardware for Propellant Service

Beeson, Harold, NASA White Sands Test Facility, USA; Kirsch, Mike, NASA White Sands Test Facility, USA; Hornung, Steven, Allied-Signal Technical Services Corp., USA; Biesinger, Paul, Allied-Signal Technical Services Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 185-192; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The NASA White Sands Test Facility (WSTF) is developing cleaning and verification processes to replace currently used chlorofluorocarbon-113- (CFC-113-) based processes. The processes being evaluated include both aqueous- and solvent-based techniques. Replacement technologies are being investigated for aerospace hardware and for gauges and instrumentation. This paper includes the findings of investigations of aqueous cleaning and verification of aerospace hardware using known contaminants, such as hydraulic fluid and commonly used oils. The results correlate nonvolatile residue with CFC 113. The studies also

include enhancements to aqueous sampling for organic and particulate contamination. Although aqueous alternatives have been identified for several processes, a need still exists for nonaqueous solvent cleaning, such as the cleaning and cleanliness verification of gauges used for oxygen service. The cleaning effectiveness of tetrachloroethylene (PCE), trichloroethylene (TCE), ethanol, hydrochlorofluorocarbon 225 (HCFC 225), HCFC 141b, HFE 7100(R), and Vertrel MCA(R) was evaluated using aerospace gauges and precision instruments and then compared to the cleaning effectiveness of CFC 113. Solvents considered for use in oxygen systems were also tested for oxygen compatibility using high-pressure oxygen autogenous ignition and liquid oxygen mechanical impact testing.

Author

Cleaning; Environment Effects; Alternatives; Aqueous Solutions; Cleaners; Chlorofluorocarbons; Spacecraft Equipment; Propellants

19980010209 United Space Boosters, Inc., Materials and Processes Dept., Huntsville, AL USA

Replacement of Dichromate Catalyst Polysulfide Sealant

Conway, Christina M., United Space Boosters, Inc., USA; Mitchell, Mark A., United Space Boosters, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 203-211; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Several different catalysts may be used in two-part polysulfide sealant systems to cause polymerization of the prepolymer. The present sealant used on the Space Shuttle Solid Rocket Boosters (SRBs) contains a dichromate oxidizing agent. Due to health and environmental concerns related to the use of chromium compounds, a program has been undertaken to replace the current sealant with a system that dramatically reduces the total volume of chromated materials used. The resultant benefit is two-fold: reducing the hazardous waste generated during SRB hardware refurbishment and limiting potential worker exposure to chromium, which is listed as a carcinogen. Through a qualification program downselection, a single sealant was selected for hardware overseas applications. A second, corrosion-inhibitive sealant was selected by a joint NASA-MSFC/USBI Corrosion Control Team for faying surface applications. The second sealant does contain free chromium from which corrosion-inhibitive properties are derived. However, use of this two sealant system reduces the total volume of chromated materials by approximately ninety percent. Future work will address replacing the sealant that comprises the remaining ten percent.

Author

Chromium Compounds; Hazardous Materials; Sealers; Space Shuttle Boosters; Catalysts; Polymerization; Polysulfides; Prepolymers

19980010216 NASA Marshall Space Flight Center, Huntsville, AL USA

Space Shuttle Reusable Solid Rocket Motor (RSRM) Hand Cleaning Solvent Replacement at Kennedy Space Center (KSC)

Keen, Jill M., Thiokol Corp., USA; DeWeese, Darrell C., NASA Marshall Space Flight Center, USA; Key, Leigh W., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 277-286; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

At Kennedy Space Center (KSC), Thiokol Corporation provides the engineering to assemble and prepare the Space Shuttle Reusable Solid Rocket Motor (RSRM) for launch. This requires hand cleaning over 86 surfaces including metals, adhesives, rubber and electrical insulations, various painted surfaces and thermal protective materials. Due to the phase-out of certain ozone depleting chemical (ODC) solvents, all RSRM hand wipe operations being performed at KSC using 1,1,1-trichloroethane (TCA) were eliminated. This presentation summarizes the approach used and the data gathered in the effort to eliminate TCA from KSC hand wipe operations.

Author

Solid Propellant Rocket Engines; Cleaning; Environment Effects; Cleaners; Replacing; Engine Parts

19980010217 Rockwell International Corp., Rocketdyne Div., Canoga Park, CA USA

Elimination of Ozone Depleting Chemicals: Cleanliness Verification Alternatives

Douglas, Vonnice M., Rockwell International Corp., USA; Fritzemeier, Marilyn L., Rockwell International Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 287-298; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Historically, cleanliness verification of Space Shuttle Main Engine (SSME) hardware was primarily performed by flushing the hardware with 1,1,1-trichloroethane or other ozone depleting solvents. An aliquot of the flush solvent was filtered and analyzed for nonvolatile residue and particulate matter. Due to environmental regulations, the use of 1,1,1-trichloroethane has been eliminated at Rocketdyne. Two methods have been selected for nonvolatile residue determination which do not require the use of ozone

depleting chemicals, an aqueous method that utilizes total organic carbon analysis and a gravimetric cyclohexane technique. An aqueous method has been selected to replace solvent techniques for particulate analysis. Laboratory qualification testing has been completed using hardware and contaminants representative of those encountered in production. The transition from research and development to full production implementation has been completed and the particulate and nonvolatile residue techniques are currently being utilized in manufacturing processes.

Author

Space Shuttle Main Engine; Cleanliness; Ozone Depletion; Flushing; Alternatives; Cleaners; Aqueous Solutions; Gravimetry; Cyclohexane; Carbon

19980010219 Rockwell International Corp., Space Systems Div., Downey, CA USA

The Search for a Replacement for CFC 113 in the Precision Cleaning and Verification of Shuttle Hardware

Wittman, C. L., Rockwell International Corp., USA; Eichinger, E. C., Rockwell International Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 311-318; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Increasingly stringent regulations regarding the production and use of chlorofluorocarbons (CFCs) have been enacted due to these compounds' detrimental effects on atmospheric ozone. CFC 113 (trichlorotrifluoroethane), used extensively in the past for many different manufacturing processes at Rockwell International, Space Systems Division, is being phased out due to a 1996 production ban. The identification, testing, and implementation of new materials and/or procedures for use as replacements for CFC 113 in these processes is the focus of several ongoing research efforts. The majority of the hardware used with or on the Shuttle requires high levels of cleanliness, for both operational requirements and because of compatibility concerns. Certain types of hardware, most notably those from oxidizer systems and especially assembled components, currently require the use of CFC 113 for both their precision cleaning and subsequent cleanliness verification. CFC 113, because of its high vapor pressure, low toxicity, nonflammability, and ability to solubilize many common contaminants, has been used at Rockwell, as well as many other companies, to both remove and verify the removal of contaminants from these types of hardware. The identification and testing of potential replacement fluids for CFC 113 in this application is the subject of this report. Candidate fluids representing many different classes of materials were screened as to their efficacy in removing common Shuttle service and manufacturing fluids. The two best candidates from these screening tests were then selected, and compatibility/exposure and component cleaning tests are ongoing.

Author

Chemical Cleaning; Manufacturing; Spacecraft Components; Cleaners; Environment Effects; Ozone Depletion; Replacing; Contaminants

19980010220 NASA Kennedy Space Center, Cocoa Beach, FL USA

Evaluation of AK-225(R), Vertrel(R) MCA and HFE A 7100 as Alternative Solvents for Precision Cleaning and Verification Technology

Melendez, Orlando, NASA Kennedy Space Center, USA; Trizzino, Mary, Florida Technology, USA; Feddersen, Bryan, Georgia Inst. of Tech., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 319-327; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The National Aeronautics and Space Administration (NASA), Kennedy Space Center (KSC) Materials Science Division conducted a study to evaluate alternative solvents for CFC-113 in precision cleaning and verification on typical samples that are used in the KSC environment. The effects of AK-225(R), Vertrel(R), MCA, and HFE A 7100 on selected metal and polymer materials were studied over 1, 7 and 30 day test times. This report addresses a study on the compatibility aspects of replacement solvents for materials in aerospace applications.

Author

Solvents; Replacing; Environment Effects; Chemical Cleaning; Performance Tests; Chlorofluorocarbons

19980010222 Allied-Signal Corp., Federal Manufacturing and Technologies, Kansas City, MO USA

Environmentally Compliant Adhesive Joining Technology

Tira, James S., Allied-Signal Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 335-342; In English; Also announced as 19980010184

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Adhesive joining offers one method of assembling products. The advantages of adhesive joining and assembly are many and include the distribution of applied forces, lighter weight, and appealing appearance, just to name a few. Selecting environmentally safe adhesive materials and accompanying processes is paramount in today's business climate if a company wants to be environ-

mentally conscious and stay in business. Four areas of adhesive joining- (1) adhesive formulation and selection, (2) surface preparation, (3) the adhesive bonding process, and (4) waste and pollution generation, clean-up, and management- all need to be carefully evaluated before adhesive joining is selected for commercial as well as military products. Designing for six sigma quality must also be addressed in today's global economy. This requires material suppliers and product manufacturers to work even closer together.

Author

Adhesive Bonding; Environment Effects; Replacing

19980010227 NASA Marshall Space Flight Center, Huntsville, AL USA

Comparison of Environmentally Friendly Space Compatible Grease to its Predecessor in a Space Mechanism Bearing Test Rig

Jett, T. R., NASA Marshall Space Flight Center, USA; Baker, M. A., NASA Marshall Space Flight Center, USA; Thom, R. L., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 391-412; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Perfluoroalkylpolyether (PFPE) greases are used extensively in critical flight hardware in a space environment. In the past, these greases have been processed using chlorofluorocarbon (CFC) based solvents. In response to the recent ban of CFC's, new formulations of environmentally friendly PFPE greases that are not processed with CFC based solvents were developed. The purpose of this study was to compare the performance of a new environmentally friendly formulation PFPE grease to a previously proven space compatible formulation PFPE grease. A one year test using 20 small electrical motors (two bearings per motor) was conducted in a high vacuum environment (2.0×10^{-4} Torr) at a temperature of 90 C. Twenty bearings were lubricated with a new environmentally friendly formulation, and twenty bearings were lubricated with an old formulation. The mass of each lubricated bearing was measured both pre and post test. Along with mass loss measurements a profilometer trace was taken to measure post test wear of the bearings. In addition the bearings were visually examined and analyzed using an optical microscope.

Author

Greases; Chlorofluorocarbons; Solvents; Environment Effects; Performance Tests; Spacecraft Components; Polyether Resins; Lubricants

19980010228 NASA Marshall Space Flight Center, Huntsville, AL USA

Development and Implementation of Environmentally Compatible Solid Film Lubricants

Novak, Howard L., United Space Boosters, Inc., USA; Hall, Phillip B., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 413-418; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Multi-body launch vehicles require the use of Solid Film Lubricants (SFLs) to allow for unrestricted relative motion between structural assemblies and components during lift off and ascent into orbit. The Space Shuttle Solid Rocket Booster (SRB), uses a dual coat, ceramic-bonded high temperature SFL in several locations such as restraint hardware between the SRB aft skirt and the Mobile Launch Platform (MLP), the aft SRB/External Tank (ET) attach struts, and the forward skirt SRB/ET attach ball assembly. The proposed National Launch System (NLS) may require similar applications of SFLs for attachment and restraint hardware. A family of environmentally compatible nonlead/antimony bearing alternative SFLs have been developed including a compatible repair material. In addition, commercial applications for SFLs on transportation equipment, all types of lubricated fasteners, and energy related equipment allow for wide usage of these new lubricants. The new SFLs named BOOSTERLUBE is a family of single layer thin film (0.001 inch maximum) coatings that are a unique mixture of non-hazardous pigments in a compatible resin system that allows for low temperature curing (450 F). Significant savings in energy and processing time as well as elimination of hazardous material usage and disposal would result from the non-toxic onestep SFL application. Compatible air-dry field repair lubricants will help eliminate disassembly of launch vehicle restraint hardware during critical time sensitive assembly operations.

Author

Solid Lubricants; Space Shuttle Boosters; Environment Effects; External Tanks; Thin Films; Bearings; Coatings; Pigments; Resins

19980010240 Naval Surface Warfare Center, Indian Head, MD USA

The Design of a Small Transportable Solid Rocket Motor Exhaust Scrubber

Elliott, K. C., Naval Surface Warfare Center, USA; Hickling, Alan, Planning Research Corp., USA; McFadden, Robert, Planning Research Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 523-531; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The Naval Surface Warfare Center, Indian Head Division (NSWC/IHD) is being funded by CN045 to develop a system to scrub rocket motor exhaust gases from test firings. NSWC/IHD has initiated a pilot program to design and fabricate a transportable system to perform this scrubbing without adversely affecting static testing results. This effort will also provide data future scale-up design efforts. This paper addresses previous scrubber design efforts, current design requirements and constraints, our design approach, and elements of the final design.

Author

Scrubbers; Static Tests; Exhaust Gases; Rocket Engines; Rocket Exhaust; Test Firing; Cleaning

19980010243 Pennsylvania State Univ., Applied Research Lab., State College, PA USA

Environmental Impact and Treatment of Reformulated Chemical Agent Resistant Coatings

Striebig, Bradley A., Pennsylvania State Univ., USA; Schneider, Janice M., Pennsylvania State Univ., USA; Watt, Lewis, Pennsylvania State Univ., USA; Vargo, Ron, Marine Corps, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 575-584; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The Applied Research Laboratory at The Pennsylvania State University has investigated a hybrid air pollution control system (APCS) to treat an NMP (N-methyl-2-pyrrolidinone) laden air stream. This system has been described in "Air Pollution Control System Research - an Iterative Approach to Developing Affordable Systems" presented at the First Aerospace Environmental Technology Conference. This research was performed concurrently with the reformulation of the CARC coatings to ensure current air treatment systems were capable of removing NMP from exhaust air streams. Bench scale and pilot scale studies focused on the absorption of NMP into an aqueous phase and destruction of the NMP through advanced oxidation processes. NMP was effectively removed from an air stream using the hybrid APCS. The hybrid system design was optimized for the removal and destruction of NMP from exhaust air streams. Advanced oxidation processes destroyed NMP in the aqueous phase. The products of the oxidation reactions of NMP were determined. The results of these studies show the reformulated CARC is a beneficial step in pollution prevention. The VOC content of the coating was reduced and the replacement solvent NMP was removed using a scale model APCS installed at the ARL facility.

Author

Air Pollution; Pollution Control; Organic Compounds; Environment Effects; Replacing; Air Flow; Protective Coatings; Solvents

19980010245 Lockheed Martin Energy Systems, Inc., Oak Ridge, TN USA

Testing of Solvents for Removal of Urethanes/Epoxyes

Thompson, Lisa M., Lockheed Martin Energy Systems, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 591-597; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

For many years, methylene chloride has been the solvent of choice for softening or dissolving polyurethane and epoxy bonds and/or coatings. However, methylene chloride has been implicated as a suspect carcinogen and is now regulated under the Resource Conservation and Recovery Act (RCRA), as a hazardous air pollutant under the Clean Air Act (CAA), and is in the rulemaking process by the Occupational Safety and Health Administration (OSHA) to have the permissible exposure limit lowered from 500 to 25 ppm for an 8 hour time weighted average. Because of these concerns, many people have begun investigating alternatives for methylene chloride in this application. For paint removal, many people have turned to dry methods or various types of stripping using carbon dioxide pellets, baking soda, com husks, etc. However, in some applications due to geometry constraints these methods cannot be used. Personnel at the Oak Ridge Y-12 Plant have been investigating many solvents or solvent blends as substitutes for methylene chloride. Several different pure solvents of various chemical types have been tested along with blends formulated using Hansen Solubility Parameter Theory which states that solvents with similar parameters will have similar dissolution properties. Initially, the solvents were screened by conducting weight gain tests on pieces of cured urethane and/or epoxyes. Solvents or solvent blends which appeared promising were tested more thoroughly. Four solvent blends have been tested on thin bondlines of polyurethane with some success. Solvents have also been tested on panels coated with both urethanes and epoxyes.

Author

Chemical Cleaning; Environment Effects; Paint Removal; Epoxy Resins; Polyurethane Resins; Solvents; Performance Tests; Substitutes; Coatings

19980010247 NASA Marshall Space Flight Center, Huntsville, AL USA

The Effects of Long Term Cure on Offgassed Products of Coatings

Engle, Ginger, NASA Marshall Space Flight Center, USA; Whitfield, Steve, NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 607-613; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The Environmental Chemistry and Compatibility Team at The Marshall Space Flight Center conducts toxic offgassing analysis on materials and flight hardware for use in habitable environments aboard the Space Shuttle and the International Space Station. As part of Research and Development, the Toxic Offgassing Laboratory conducted a long term cure study on four polyurethane coatings which are slated for potential use on Space Station. This study demonstrates the effects of cure time and temperature on the total tox value (sum T) and the maximum usage weight for each coating. All analysis was conducted according to test procedures outlined specifically for Space Station environments. Therefore, the ratings and weight limits generated for these materials are most applicable to space environments. However, this test does give some indication of time frames for solvent removal and is therefore of interest to, the environmental community as a whole.

Author

Coating; Polyurethane Resins; Space Stations; Toxicity; Offgassing; Curing; Solvents; Space Shuttles

19980010249 Wright Lab., Wright-Patterson AFB, OH USA

Air Force Aeronautical Systems Center Hazardous Materials Alternatives Guide: A Creative Way to Better Exchange Information

Folck, James, Wright Lab., USA; Lockwood, Lyle, Universal Technology Corp., USA; Alford, Chales, Universal Technology Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 621-630; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This paper describes the results of work at Aeronautical Systems Center to develop more effective and easier ways to exchange technical and project information dealing with hazardous materials alternatives. The paper will discuss the background of the ASC technical effort and describe the features and content of the ASC Guide as it now resides on the Internet. It will also convey thoughts on future use and development of the resource.

Author

Hazardous Materials; Alternatives; Environment Effects; Information Dissemination; Information Systems

19980010251 Pratt and Whitney Aircraft, Government Engines and Space Propulsion, West Palm Beach, FL USA

Elimination/Reduction of Ozone Depleting Substances and 'EPA 17' Materials in F100 Worldwide Maintenance Manuals

Privett, Mal, Pratt and Whitney Aircraft, USA; Gehron, Mike, Pratt and Whitney Aircraft, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 644-646; In English; Also announced as 19980010184

Contract(s)/Grant(s): F41608-95-D-0082; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The maintenance manuals (Technical Orders) for the F100 family of military jet engines comprises approximately 163 series of volumes with approximately 118,000 pages of instructions. A program to eliminate all ozone depleting chemicals (ODC) and reduce or eliminate large use quantities of EPA 17 materials from these Technical Orders was performed. A database was developed to manage the program status and material usage and replacement documentation for each applicable usage within the manuals, as well as generate many of the formal contractual reports. The review process efficiency was dramatically increased by digitizing the manual pages, using keywords to locate the ODC and EPA 17 materials, and categorizing the technical application parameters. This database permitted multiple substitutions, eliminated redundancy, and led to a better understanding of the process based on how the information about the material usage was grouped. As an example, greater than 1800 locations of ODC materials were originally identified; ultimately it was found, using the database, that all of the uses could be categorized into less than 30 different applications. It was generally found that most of the ODC material uses were substituted without testing of alternatives, since substitutions could often be based on similar uses of the alternative in other applications.

Author

Jet Engines; Aircraft Maintenance; Ozone Depletion; Alternatives; Manuals; Chemical Compounds

19980010252 Petroferm, Inc., Fernandina Beach, FL USA

Testing and Qualification of HFE Cleaning Agents in Vapor Degreasing Applications

Hayes, Michael E., Petroferm, Inc., USA; Hrebenar, Kevin R., Petroferm, Inc., USA; Monaghan, Michael O., Petroferm, Inc., USA; Smiley, Carroll B., Petroferm, Inc., USA; Stewart, Richard K., Jr., Petroferm, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 647-655; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

There is no satisfactory replacement for vapor degreasing in many metal and precision parts manufacturing and cleaning tasks, including a variety of electronics printed wiring assembly, printed wiring board and component applications. This paper describes a new, environmentally friendly, second-generation vapor degreasing process that uses a hydrofluoroether (HFE). The new process can permanently replace both 1,1,1-trichloroethane and CFC-113 in a wide variety of cleaning applications vital to the industry, as well as chlorinated solvents such as methylene chloride, trichloroethylene (TCE), perchloroethylene and

HCFC-141b. Importantly, this new fluorochemical-based process operates very satisfactorily in unmodified, modern vapor degreasing equipment, or in slightly modified older but well maintained equipment. Thus, this alternative may offer the possibility of an eleventh-hour rescue for many organizations that delayed converting or couldn't afford the equipment necessary to use other alternatives to ozone-depleting solvents. It also is extremely attractive for those whose first alternative choice has not fully met their expectations, or whose circumstances, designs and requirements have changed. From the equipment operator's perspective, HFE processes are run identically to a conventional vapor degreasing process in which the parts are immersed in the boil sump, rinsed in the next sump and then quickly dried in the vapor. HFE process results to date can be summarized as follows: (1) HFE processes have been satisfactorily implemented in several completely unmodified pieces of conventional vapor degreasing equipment. (2) HFE cleaned routine production parts at least as well as HCFC-141b, TCE or aqueous cleaning does in current operations. (3) No compatibility problems were encountered with the HFE process. (4) HFE process cycle times were equal to or less than those used in production with HCFC-141b or TCE, and far shorter than those for aqueous cleaning. (5) HFE solvent emissions were much lower than those from HCFC-141b or TCE. (6) Preliminary economic analysis suggests that cleaning costs for the new process are competitive with or lower than those of other cleaning processes. These conditions are thought to be typical of other, similar manufacturing operations.

Author

Cleaners; Environment Effects; Alternatives; Solvents; Hydrogen Compounds; Ethers; Manufacturing; Chemical Cleaning

19980010253 Rockwell International Corp., Rocketdyne Div., Canoga Park, CA USA

Non-ODS Handwipe Cleaner for Precision Cleaned Space Shuttle Main Engine Hardware

Price, Marlene, Rockwell International Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 657-672; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Various assembly, test, and handling operations are performed upon precision cleaned Space Shuttle Main Engine (SSME) hardware after the final required cleanliness levels have been verified. This cleanliness level must be maintained throughout these operations to ensure the successful function of the SSME during test and flight. Historically, the same solvents used to perform the cleanliness verification of precision cleaned hardware have also been used for handwipe operations. These solvents were trichlorotrifluoroethane (CFC-113) and 1,1,1-trichloroethane (TCA). World-wide environmental regulations halted the production of these and other ozone-depleting substances (ODSs) on December 31, 1995. A variety of aqueous and solvent candidates were reviewed and evaluated to identify an acceptable handwipe replacement for CFC-113 and TCA.

Author

Space Shuttle Main Engine; Cleaners; Engine Parts; Cleanliness; Environment Effects; Solvents; Aqueous Solutions

19980010254 Pratt and Whitney Aircraft, Government Engines and Space Propulsion, West Palm Beach, FL USA

Replacement of Hazardous Solvents for Handwiping Operations in Gas Turbine Engine Manufacturing

Privett, Mal, Pratt and Whitney Aircraft, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 673-678; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

A substantial amount of hazardous solvents, primarily methyl ethyl ketone (MEK) and isopropyl alcohol (IPA) are used in the manufacturing of components used in gas turbine engines. Although many cleaners have been approved for general tooling and fixture cleaning, specialty applications still consume a significant quantity of the solvents. This is especially significant since the hazardous waste volume is much greater than the solvent itself, because a large amount of applicators and disposable shaping implements are used in removal of un-cured rubber and are also discarded as hazardous waste. A program was performed which eliminated the need for these solvents in hand wiping operations during manufacturing of stator airfoil assemblies. Both an aqueous and a non-hazardous hydrocarbon solvent were identified for operations involving braze surface preparation, preparation of surfaces prior to bonding of various rubber materials, removal of excess un-cured rubber, and general cleaning. The aqueous hand wiping operation is used in preparation for brazing and also bonding of several types of rubber to both metallic and non-metallic substrates. The hydrocarbon cleaner is used to shape un-cured rubber for aerodynamic sealing of shroud and airfoil interfaces. The substitutions resulted in no material property or performance debit, no additional cost to the process, substantial reductions in hazardous waste disposal volume and costs, and reduced worker exposure to hazardous solvents.

Author

Gas Turbine Engines; Engine Parts; Environment Effects; Manufacturing; Hazardous Wastes; Solvents; Cleaners; Chemical Cleaning; Hydrocarbons; Aqueous Solutions

19980010255 Thiokol Corp., Brigham City, UT USA

The Elimination of Methyl Chloroform Solvent Used for the Cleaning of Propellant Contaminated Tooling During the Production of the Space Shuttle Solid Rocket Motors

Johnson, Erik P., Thiokol Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 679-691; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Thiokol Corporation, Space Operations, Mix/Cast Work Center uses methyl chloroform as a cleaning solvent throughout the reusable solid rocket motor propellant production process. Testing to select and qualify suitable replacements for methyl chloroform has been performed. This effort was initiated to comply with amendments to the Clean Air Act that ban production of methyl chloroform after January 1, 1996. The two solvents selected for methyl chloroform replacement are Ionox BC(R) and PF Degreaser(R). Selection and qualification testing evaluated propellant/motor integrity, materials compatibility, safety, cleaning effectiveness, combustion sensitivity, and environmental effects. Test results showed that all presently used production materials were compatible with Ionox BC and PF Degreaser, and that propellant properties/motor integrity and bond strengths were as good as, or better than, those obtained from methyl chloroform cleaning processes.

Author

Methyl Compounds; Environment Effects; Chemical Cleaning; Propellants; Chloroform; Solvents; Cleaners; Solid Propellant Rocket Engines; Contaminants

19980010257 NASA Marshall Space Flight Center, Huntsville, AL USA

Adhesion Performance of Solid Film Lubricants on Substrates Cleaned With Environmentally Compliant Cleaners

Hall, P. B., NASA Marshall Space Flight Center, USA; Thom, R. L., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 703-707; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

Solid film adhesion testing was used to determine the effect different environmentally compliant cleaners have on the adhesion properties of solid film lubricants used for several NASA programs. In an action to remove ozone depleting chemicals from aerospace processes, a replacement cleaner must be identified that does not affect the adhesion of solid film lubricants used on flight critical NASA hardware. ASTM D251083 Standard Test Method for Adhesion of Solid Film Lubricants was used to evaluate the cleaners. Two different lubricants - Inlox 88 and Boosterlube - were tested using various commercially available cleaners. Inlox 88 is produced by E/M Corporation and is a liquid oxygen compatible lubricant used in the Space Shuttle Main Engine, and Boosterlube is a new lubricant being implemented for use on the Space Shuttle Solid Rocket Booster. These lubricants were selected because of their specific use on flight critical NASA components. Results of this testing are presented in the paper.

Author

Cleaners; Solid Lubricants; Alternatives; Adhesion; Environment Effects; Performance Tests; Adhesion Tests; Space Shuttle Main Engine

19980010426 NERAC, Inc., Tolland, CT USA

Microstructure of Thermal Spray Coatings. (Latest Citations from METADEX)

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862800; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the effect and correlation of the microstructure of thermal spray coatings on properties. Citations focus on the characterization, corrosion, and wear behavior of flame, plasma, and ion beam spraying. Among the coatings examined are zirconia, alumina, tungsten, ceramic, intermetallic, and nickel alloy types. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Microstructure; Coatings; Flame Spraying

19980010437 NERAC, Inc., Tolland, CT USA

Zirconium Phosphates. (Latest Citations from the Energy Science and Technology Database)

Feb. 1996; In English

Report No.(s): PB96-863394; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the production, physical properties, and applications of zirconium phosphate materials. Articles discuss ion exchange properties, radiation effects, crystal structures, and sorption effects with radionuclides.

Citations address applications to clean-up of radioactive waste materials and heavy metal absorption by these zirconium phosphate-based controlled porosity materials.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Zirconium Compounds; Phosphorus Compounds; Ion Exchanging

19980010538 University of North Texas, Dept. of Physics, Denton, TX USA

Development of Polymer Gel Sensors and Devices Controlled by Infrared Light and Ultrasonic Waves *Final Report*

Hu, Zhibing, University of North Texas, USA; Aug. 24, 1997; 5p; In English

Contract(s)/Grant(s): DAAH04-93-G-0215

Report No.(s): AD-A332547; ARO-32112.14-CH-SM; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This research aims to develop sensors and devices based on polymer gels. We have made significant progress toward understanding, synthesis and application of gel systems. The major inventions are: (1) Synthesis and application of modulated polymer gels; (2) Bending of N-isopropylacrylamide gel under influence of infrared light; (3) CO₂ laser controlled transmission of visible light in N-isopropylacrylamide gel; (4) Shape memory gels have been synthesized based on spatial modulation of the chemical nature of gels. A variety of shapes have been obtained including 'spiral', 'fish', 'numbers', 'alphabets' and 'tube'; and (5) Change of the ultrasonic attenuation near the volume phase transition of gels. The accomplishments for the past four years have been published in 16 papers including one in Science, four in Journal of Chemical Physics, three in macromolecules, and two in Journal of Applied Polymer Science. Some of the results have been reported by Chemical and Engineering News (June 9, p.36-37, 1997), and Chemistry & Industry (July 15, p.531-532,1996). One patent was filed to the U. S. Patent Office. Two graduate students have obtained their Ph.D. under the support of the ARO grants.

DTIC

Infrared Radiation; Product Development; Gels; Controllability; Conducting Polymers

19980010541 North Carolina State Univ., Chemical Engineering, Raleigh, NC USA

Selected Energy Epitaxial Deposition and Low Energy Electron Microscopy of AlN, GaN and SiC Thin Films *Quarterly Report, 1 Jul. - 30 Sep. 1997*

Davis, R. F., North Carolina State Univ., USA; Lamb, H. H., North Carolina State Univ., USA; Tsong, I. S. T., Arizona State Univ., USA; Sep. 1997; 40p; In English

Contract(s)/Grant(s): N00014-95-I-0122

Report No.(s): AD-A332413; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The kinematic conditions under which III-Nitrides films can be grown were determined using efficient local-orbital molecular-dynamics simulations. Reaction paths for the impact of ammonia molecules on the cation- and anion-terminated surfaces of GaN and AlN were also determined. In situ growth experiments of GaN on 6H-SiC(0001) substrates were conducted in the low-energy electron microscope (LEEM). Initial nucleation at the steps and subsequent growth across the terraces were observed. The LEED patterns indicated three-dimensional crystal growth with pronounced formation of facets. Such growth behavior occurred irrespective of the method of deposition. A seeded beam source chamber has been interfaced with a UHV deposition chamber. Films of AlN have been grown with this system. Smooth, homoepitaxial GaN films were grown using an effusive Ga source and an NH₃-seeded supersonic molecular beam. A small Ga flux-substrate temperature window was found that allows for two-dimensional homoepitaxial growth under MBE-like conditions (TS=730 deg C, pb-2x10(exp -6) Torr). Mass-analyzed Ga(+), N₂(+) and N(+) ions at approx. 20 eV with a small energy spread of tilde 1 eV at FWHM were produced via two Colutron units with deceleration lenses. Ion beams of N₂(+) and N(+) were used to perform nitridation of Si(100) surfaces. Subsequent SIMS depth profiles indicated the presence of nitride layers on the Si(100) substrates. Codeposition of Ga and N on Si(111) and Si(100) substrates was conducted with the Ga(+) and N₂(+) ion beams. SIMS depth profiles showed the presence of both Ga and N on the Si substrate surfaces suggesting the formation of a GaN layer. A second generation arc-heated jet source and an inexpensive corona discharge source were designed, fabricated and characterized.

DTIC

Electron Microscopes; Electron Microscopy; Energy Transfer; Epitaxy; Flat Surfaces; Ion Beams; Thin Films; Molecular Beams; Molecular Dynamics

19980010543 Wisconsin Univ., Milwaukee, WI USA

An Intelligent Reactor for Controlled Sputter Deposition of Ceramic Oxide Nanolaminates *Final Report*

Aita, Carolyn R., Wisconsin Univ., USA; Feb. 06, 1997; 10p; In English

Report No.(s): AD-A332327; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A single piece of equipment was purchased, consisting of a multiple cathode, radio frequency-excited sputter deposition apparatus that is entirely automated. The equipment is custom-made, was designed and built by TM Vacuum Products, Inc., 630 Warrington Avenue, Cinnaminson, NJ. A detailed description of the equipment is attached. The equipment does not differ from that described in the original grant proposal. The equipment is used to fabricate thin film ceramic nanolaminates. These nanolaminates consist of multilayer stacks in which the constituents are usually polycrystalline. Unique mechanical and chemical properties are achieved because of the nanoscale of each bilayer. These properties include transformation-toughening, enhanced hardness, high temperature stability, and corrosion resistance. A related patent entitled 'Multilayer Nanolaminates Containing Polycrystalline Zirconia,' has been issued. This patent was developed under DoD funding. To date we have used the equipment to fabricate multilayers of zirconia-alumina, zirconia-yttria, yttria-alumina, titania-zirconia, and titanium nitride-aluminum nitride.

DTIC

Electrodeposition; Chemical Reactors; Sputtering; Thin Films; Reactor Materials; Reactor Design; Nanocrystals

19980010550 NERAC, Inc., Tolland, CT USA

Developments in Reinforcing Fibers: Glass Fibers (Latest Citations from Engineered Materials Abstracts)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863659; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the production and marketing of glass reinforcing fibers. References discuss market and technology trends, new fibers and fiber blends and their production methods, and application to new composite materials. New developments in carbon and graphite fibers are discussed in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Glass Fibers

19980010551 NERAC, Inc., Tolland, CT USA

Powder Processing of Nitrides (Excluding Hot Isostatic Processing) (Latest Citations from Engineered Materials Abstracts)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863667; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties and processing of metal nitride ceramics and refractories. Citations consider compacting and sintering processes. Phase transformations, crystallization, and devitrification processes are considered. Aluminum nitride, boron nitride, silicon nitride, silicon oxynitride, and titanium nitride are among materials discussed. The use of hot isostatic pressing is considered in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Ceramics; Metal Nitrides; Powder Metallurgy; Refractories

19980010564 NERAC, Inc., Tolland, CT USA

Reaction Sintering: Ceramic Materials. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866587; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theoretical analyses and laboratory investigations of reaction sintering processes. Fabrication and characterization of reaction sintered ceramic materials, including silicon nitride, zirconium compounds, and silicon carbide, are discussed. Hardness, density, mechanical strength, corrosion and oxidation resistance, and thermal stability are among the properties considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Ceramics

19980010566 Steel Structures Painting Council, Pittsburgh, PA USA

Strategy for Coating Structural Steel Without Stringent Blasting Requirements Final Report

Boocock, S. K., Steel Structures Painting Council, USA; Oct. 1995; 69p; In English

Report No.(s): PB96-147996; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This study explored the feasibility of a process for applying protective paint coating on structural steel without the need for blast cleaning. The two technologies employed were a high penetration primer with fractured glass microspheres for optimized topcoat adhesion and zero volatile organic compound (VOC) plastic thermal spray polymer or liquid applied topcoats. Results of laboratory tests show that thermal spray coating systems employing a zero VOC penetrating sealer loaded with glass microspheres are a viable option for overcoating aged alkyd paints. The addition of microspheres to the penetrating primer had no effect on the performance of the thermal spray coating systems. Microscopic examination of imbedded broken microspheres indicates the potential for enhanced adhesion between the primer and the thermal spray topcoat. The liquid applied zero VOC topcoat is also a viable option for overcoating aged alkyd systems. The epoxy mastic control system performed as well as, or better than any of the other systems tested in the accelerated laboratory exposure.

NTIS

Protective Coatings; Coating; Reinforcing Materials; Steels; Bridges (Structures); Spraying; Paints

19980010573 NERAC, Inc., Tolland, CT USA

Impact Modifiers for Polymers. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English

Report No.(s): PB96-866355; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents for blends and compositions used to improve the impact resistance of polymer materials. Descriptions of specific compositions, including thermoplastic materials, and preparation techniques, are emphasized. Block copolymer modifiers are included. While emphasis is placed on thermoplastic materials, some attention is given to elastomers. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Impact Resistance; Plastics

19980010574 NERAC, Inc., Tolland, CT USA

Carbon Black in Elastomers. (Latest Citations from the Ei Compendex*Plus Database)

Mar. 1996; In English

Report No.(s): PB96-866363; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of carbon black in elastomers. The effects of carbon black on shrinkage and the physical and chemical properties of a variety of formulations with elastomers are discussed. Reinforcing qualities, mixing problems, carbon black variations, and applications are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Elastomers; Carbon

19980010581 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Absorption and Luminescence of Pyridine-Based Polymers

Jessen, S. W., Ohio State Univ., USA; Blatchford, J. W., Ohio State Univ., USA; Lin, L. B., Ohio State Univ., USA; Gustafson, T. L., Ohio State Univ., USA; Partee, J., Ohio State Univ., USA; Sep. 20, 1997; 8p; In English

Contract(s)/Grant(s): N00014-95-I-0302; N00014-92-J-1369

Report No.(s): AD-A330166; P289; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

We summarize the low energy photophysics of the pyridine-based polymers poly (p-pyridine) (PPy), poly (p-pyridyl vinylene) (PPyV) and copolymers made up of PPyV and poly (p-phenylene vinylene) (PPyVPV). The absorption and luminescence properties are morphology dependent. The primary photoexcitations within these polymers are singlet excitons which may emit from individual chains following a random walk to lower energy segments, depending upon the excitation energy. Films display redshifted absorption and emission properties with a decrease in photoluminescence efficiency which can be attributed to aggregate formation in comparison to powder and solution forms. Photoinduced absorption (PA) studies show direct conversion of singlet to triplet excitons on the ps time scale. Polaron signatures and the transition between triplet exciton states are seen in powder forms using ms PA techniques. Film forms display only a polaron signature at millisecond times indicating that morphology plays a key role in the long-time photophysics for these systems. Photoluminescence detected magnetic resonance studies also have

signatures due to both polaron and triplet excitons. The size of the triplet exciton is limited to a single ring suggesting that the triplet exciton may be trapped by extrinsic effects.

DTIC

Pyridines; Adsorption; Copolymers; Photoluminescence; Conducting Polymers

19980010588 Cortest Columbus Technologies, OH USA

Improved Concretes for Corrosion Resistance *Interim Report*

Thompson, N. G., Cortest Columbus Technologies, USA; Lankard, D. R., Cortest Columbus Technologies, USA; May 1997; 178p; In English

Contract(s)/Grant(s): DTFH61-93-C-00028

Report No.(s): PB97-179451; FHWA-RD-96-207; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

A major cause of concrete deterioration on bridge structures is the corrosion of the embedded steel reinforcement. In response to the continued problem of corrosion, FHWA initiated this research aimed at (1) quantifying the corrosive conditions fostering concrete bridge deterioration and (2) identifying concrete materials which consistently provide superior performance when used in bridge applications. The experimental phase of this research project was divided into three tasks: Task A - Corrosive Environment Studies, Task B- Concrete Chemical and Physical Properties, and Task C - Long-Term Corrosion Performance. This Interim Report reviews the results of tasks A and B and provides recommendations for performing task C. In task A, laboratory experiments were conducted to characterize the corrosive environment and to establish boundary conditions for environmental variables of moisture content, chloride concentration, and temperature. Special test specimen design and test procedures were developed to permit uniform chloride diffusion to the steel surface. A full factorial matrix of experiments were performed for three levels each of chloride concentration, relative humidity, and temperature. A regression model was developed to predict corrosion rate and corrosion potential as a function of environment for two different concretes. In task B, experiments were performed to identify the chemical components of concretes and to determine how they effect corrosion induced deterioration of concrete structures.

NTIS

Concrete Structures; Concretes; Corrosion; Deterioration; Moisture Content; Bridges (Structures); Reinforcing Materials

19980010612 NERAC, Inc., Tolland, CT USA

Silicon on Insulator. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Feb. 1996; In English

Report No.(s): PB96-863501; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning silicon on insulator (SOI) materials, substrates, structures, and devices. The design and fabrication of SOI semiconductor devices, integrated circuits, memory devices, actuators, sensors, detectors, and optical couplers are presented. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; SOI (Semiconductors)

19980010621 Rockwell International Corp., Thousand Oaks, CA USA

Rate Dependent Cohesive Zones *Final Report, 15 Apr. 1994 - 14 Sep. 1997*

Cox, B. N., Rockwell International Corp., USA; Sep. 1997; 105p; In English

Contract(s)/Grant(s): F49620-94-C-0030

Report No.(s): AD-A330185; SC-71100; AFOSR-TR-97-0513; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In work under another contract, we had studied the initiation of mode I tensile cracks (not delamination cracks) that tunnel down individual plies in brittle matrix laminates or woven textiles and then turn into plane cracks spreading across many plies en route to part failure. Under this contract, we unified this modeling with our models of cracks bridged by creeping fibers. In the absence of fiber creep, the plane strain phase of crack propagation often (and desirably) ends in crack arrest, because the plane strain crack grows into a lengthening bridging zone as the crack traverses plies. However, fiber creep relaxes the bridging and allows crack growth to resume, which leads to failure at undesirable low stresses. We developed comprehensive solutions to this mode of crack growth.

DTIC

Cohesion; Crack Propagation; Creep Properties; Failure; Plane Strain; Laminates; Crack Bridging

19980010745 Southridge High School, Kennewick, WA USA

Evaluation of Chemically Tempered Soda-Lime-Silica Glass by Bend Testing

Bunnell, Roy L., Southridge High School, USA; Piippo, Steve W., Richland High School, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 55-63; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Glass almost always fails because of tiny surface imperfections which act as stress concentrators. One strategy for decreasing susceptibility to fracture due to these imperfections is to place the surface of the glass in a state of compression, which effectively forces these imperfections closed. This may be done by chemical means, by a process of ion exchange. Sodium ions have a calculated ionic diameter of 0.19 nm, while potassium ions, with the same valence, have a diameter of 0.27 nm. If K ions replace some of the Na⁺ ions in a soda-lime-silica glass, the larger potassium ions will produce a state of compression in the glass surface. The stresses were measured to be very high, up to 860 MPa. The compressive layer in ion-exchanged glass is very thin, limited by the diffusion process to approximately 0.001 cm. Because this thin layer does not compromise the optical properties, a treatment similar to the one used here is routinely used to increase the durability of lenses for eyeglasses. In order to produce the desired ion exchange, the glass is exposed to a molten bath containing potassium ions, at a temperature high enough to promote interdiffusion but not so high that the glass structure can relax, for instance by annealing of the glass. Relaxation of the glass structure would eliminate the desired surface stress. In this experiment, compressive surface stresses were produced in soda-lime-silica glass and the fracture strength was measured using a three-point bending method to quantify the gains in mechanical strength.

Derived from text

Silica Glass; Ion Exchanging; Fracture Strength; Surface Defects; Fracturing; Metal Ions; Compressibility

19980010754 Washington Univ., Dept. of Materials Science and Engineering, Seattle, WA USA

The Effect of Surface Treatment on the Strength of Glass

Stang, Robert, Washington Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 199-210; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This experiment is fourth in a 5 hour mechanical behavior course for Junior class students in materials science and engineering. The course meets for 3 hours of lecture, a 2 hour problem session and a 3 hour lab. session each week during a 10-week quarter. The students entering this course have completed 2 quarters of course work in materials science and engineering as well as two years of lower division pre-engineering courses (90 quarter credits). The experiment serves to introduce The Modulus of Rupture (MOR) test, which is widely used to study the mechanical behavior of ceramics and other brittle materials. The data collected demonstrates the effect of surface condition on the strength of ceramic materials. This is the only experiment which uses ceramic materials in this mechanical behavior course. This experiment is performed during the period in which fracture mechanics are being discussed in the lecture. The MOR test is often used to measure the strength of brittle materials such as ceramics. It is widely used and simple to conduct. The sample usually consists of a bar with square, round or rectangular cross section so no complicated machining is necessary and no complicated grips or grip alignment is necessary. All that is needed is a three or four point bending fixture in which the sample is loaded to failure in a universal testing machine operated at a low crosshead speed. The Flexure Formula, from strength of materials for bars loaded in bending, is used to calculate the strength of the outer portion of the sample which is loaded in tension. A major problem with the MOR test is that it is very easy to damage the test frame and/or load cell when conducting an MOR test. Extreme care must be exercised because the crosshead is being driven toward the load cell when the test is being conducted. Damage to the system can easily occur if the operator is not absolutely certain of the crosshead speed and direction. The other disadvantages of the MOR test are few. The sample must break in the region subjected to the maximum bending moment, i.e. directly under the point of load application for samples loaded in three point loading or between the inner load application points for four point loading. The use of the flexure equation assumes all deformation is elastic and the results are suspect if any plastic deformation occurs. This experiment is not completely original, similar experiments have been published by Subbarao et al in Experiments in Materials Science and by Cornwell and Thornton in NEW Update 1991. The major difficulty in making this experiment work is in acquiring soda lime or flint glass rod for use as samples and using the proper processing temperatures and handling procedures. Hopefully the details provided here will make it easier to produce meaningful results.

Author

Surface Treatment; Glass; Yield Strength; Rupturing; Plastic Deformation

19980010756 University of Western Washington, Engineering Technology Dept., Bellingham, WA USA

Lost Foam Casting

Werstler, David E., University of Western Washington, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 219-226; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Lost foam casting of aluminum is an emerging technology for automotive and consumer applications because it utilizes simple equipment, generates almost no wastes, and requires little manual labor in the production of castings. It is also called the expendable pattern or full mold process because an Expandable PolyStyrene (EPS) foam pattern is immersed in loose sand and simply burned away and replaced with molten metal. It presently is utilized for about 2% of all aluminum castings produced and to a lesser extent for cast iron, and it has been a commercially viable process since 1965. This method of casting metal lends itself to near-net shapes without cores because sections of patterns can be glued together to form a more complex shape, as in investment casting. Production run size is not an issue, and even prototyping is an option because the foam patterns can be sculpted with hand tools from a block of foam, machined by CNC, or molded in a press using preexpanded beads. The only drawbacks are poor surface quality, defects due to trapped styrene combustion products, and inconsistent microstructure. Process control and placement of gates are still primarily an art but are being actively studied and improved.

Author

Casting; Foams; Aluminum; Technology Utilization

19980010762 University of Eastern Illinois, School of Technology, Charleston, IL USA

Composite of Glass Fiber With Epoxy Matrix

Liu, Ping, University of Eastern Illinois, USA; Waskom, Tommy L., University of Eastern Illinois, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 277-281; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Polymeric matrix composites have found wide applications in products such as airplanes and even fishing rods. Epoxy is the most often used matrix and glass fiber is the most economical reinforcing fibers on the market. Glass fiber reinforced epoxy matrix composites are popular composites used for such products as racing boats. In this experiment, students used a simple hand lay-up method to make the composite. Students are encouraged to apply their innovative ideas to make the material with the highest specific strength.

Derived from text

Polymer Matrix Composites; Glass Fiber Reinforced Plastics; Epoxy Matrix Composites; Reinforcing Fibers; Glass Fibers; Epoxy Resins

19980010763 University of Eastern Illinois, School of Technology, Charleston, IL USA

Making Products Using Post Consumer Recycled High Density Polyethylene: A Series of Recycling Experiments

Liu, Ping, University of Eastern Illinois, USA; Waskom, Tommy L., University of Eastern Illinois, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 283-289; In English; Also announced as 19980010742 Contract(s)/Grant(s): NSF DUE-95-50857; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Reducing the volume of solid waste disposal in landfills has drawn considerable public attention due to the decreasing number and size of landfills in the nation. It is estimated that four pounds of trash are produced daily by every man, woman and child in the USA. At this rate major cities including New York and Los Angeles will exhaust landfill space in just a few years. Philadelphia and other cities are already out of space. Because of the nature and application of packaging materials, plastics occupy about 20 per cent in volume of the landfill space. However, less than 1 percent of the plastics in the USA was recycled in 1990. Thus, recycling and reusing plastics will play a significant role in reducing the amount of solid waste disposal to landfills. Researchers are attempting to find different ways to recycle plastics and more industrial companies are becoming involved in plastic recycling activities. There is an urgent need to expose undergraduate students to materials recycling for environmental protection. This project introduced a series of plastic recycling experiments to students in materials related courses such as "polymer and composites." With the plastic recycling experiments, students not only learned the fundamentals of plastic processing and properties as in conventional materials courses, but also dealt with the effects of materials life cycle and the impact on society and environment. Many students became more environmental conscious and more knowledgeable of environmental protection.

Derived from text

Recycling; Waste Disposal; Environment Protection; Polyethylenes; Life (Durability); Plastic Properties; Landfills

19980010764 Spiegel Designs, Baltimore, MD USA

Elasticity, Plasticity and Anelasticity: Demonstrations

Spiegel, Xavier F., Spiegel Designs, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 291-295; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Among the mechanical properties of materials are the phenomena of Elasticity, Anelasticity and Plasticity. Elasticity and Plasticity are very important properties to Engineering Design. Anelasticity is a less important property today but some bright engineer will eventually show us the importance and applications of anelasticity. Elasticity is defined as the immediate deforma-

tion of a material upon the application of a load and the immediate return to the original shape when the load is released. Anelasticity is defined as the slow, ideally infinite time response to a load, and the slow, ideally infinite time, return to its original shape. Plasticity is defined as the permanent deformation of a material when a load is applied. The material retains that deformation until the material is heat treated or loaded in some way. Most metals exhibit little elasticity or anelasticity. Ceramics and glass usually exhibit no elasticity, anelasticity or plasticity except under special circumstances. Polymers exhibit elasticity, anelasticity and plasticity. Composites can exhibit, according to their structure, elasticity, anelasticity and plasticity to varying degrees.

Derived from text

Elastic Properties; Mechanical Properties; Anelasticity; Plastic Properties; Loads (Forces); Deformation; Ceramics

19980010768 Norfolk State Univ., School of Technology, VA USA

Tensile Test Experiments With Plastics

Thorogood, Michael G., Norfolk State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 329-336; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Plastics come from a wide range of raw material and processes, have so many varied properties, and take such diverse forms that they almost defy definition. All plastics lose their strength at elevated temperatures; some at relatively low temperatures; which is demonstrated in the table and graph provided. Long chained plastics (high molecular weight) causes more entanglement of the chains and thereby increases viscosity. When heat is applied, the chains tend to untangle, and the plastic will start to flow at very low stress levels.

Author

Plastics; Tensile Properties; Molecular Weight; Viscosity; Plastic Properties

19980010778 College of Western New England, Dept. of Electrical Engineering, Springfield, MA USA

Experiments in Sol-Gel: Hydroxyapatite and YBCO

Masi, James V., College of Western New England, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 455-465; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Sol-gel technologies have taken the experimenter and turned his or her world into a fantasy world of size control, materials properties, and new materials hard to realize by other more arduous methods. The use of these methods to produce both a necessary biomaterial (hydroxyapatite) and a high temperature superconducting ceramic (YBCO) is fun for both the professor and the student. Dependent on pH, concentrations, impurities, etc., a wide variety of properties may be obtained. The students learn the process of designing materials for the complex "nano-world." These two experiments can be easily explained and the hydroxyapatite experiment can be demonstrated on stage at room temperature, without a furnace. The experiment is well accepted, with many suggestions for variations coming from the students. The comments are very positive to date.

Author

Sol-Gel Processes; YBCO Superconductors

19980010823 Department of the Navy, Washington, DC USA

Transducing Composite of Sintered Piezoelectric Ceramic Granules in a Polymer Matrix

Kahn, Manfred, Inventor, Department of the Navy, USA; Chase, Mark, Inventor, Department of the Navy, USA; Jul. 30, 1997; 19p; In English

Patent Info.: US-Patent-Appl-SN-903359

Report No.(s): AD-D018614; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A piezoelectric ceramic-polymer composite is made of a substantially two-dimensional polymer matrix and a monolayer of sintered piezoelectric ceramic granules dispersed throughout the matrix so that each granule has an upper portion protruding from one side of the matrix and a lower portion protruding from the opposite side of the matrix. The composite is formed by partially embedding a monolayer of sintered piezoelectric ceramic granules in a pliable material, then partially covering the granules with a polymer resin, curing the resin to form a matrix and removing the pliable material. A transducer is formed by flattening the upper and lower portions of the granules to form coplanar top and bottom surfaces parallel to, but not coplanar with the surface of the matrix, then electroding the granule surfaces, attaching top and bottom cover plates, and sealing the transducer around the edges.

DTIC

Piezoelectric Ceramics; Transducers; Granular Materials

19980010897 Georgia Inst. of Tech., School of Mechanical Engineering, Atlanta, GA USA

Laser Measurements of Elastic Moduli of Voided Polymers Annual Report

Berthelot, Yves H., Georgia Inst. of Tech., USA; Oct. 20, 1997; 9p; In English

Contract(s)/Grant(s): N00014-97-I-0185

Report No.(s): AD-A331898; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The two complex elastic moduli (and the corresponding shear and longitudinal sound speeds) of a voided polymer have been measured as a function of frequency between 0.5 and 2.5 kHz by laser Doppler interferometry and finite element modeling. The measurement errors associated with this new technique are discussed.

DTIC

Acoustic Properties; Bulk Modulus; Laser Applications; Modulus of Elasticity; Evaluation; Shear Properties

19980010914 Johns Hopkins Univ., Homewood Research Admin., Baltimore, MD USA

Material Engineering Novel Semiconductor Structures Final Report, 16 Mar. 1994 - 15 Mar. 1997

Khurgin, Jacob B., Johns Hopkins Univ., USA; Mar. 1997; 14p; In English

Contract(s)/Grant(s): F49620-94-I-0191

Report No.(s): AD-A331656; AFOSR-97-0591TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research has focused on using the methods of 'band-gap engineering' to improve various electronic and optical properties of materials. From an experimental point of view, it has achieved the capability of routinely performing photoluminescence, photoconductivity and photoluminescence excitation measurement at the JHU facilities. Among the most important theoretical results are advances in intersubband lasers and raman oscillators, especially a new 'inverted effective mass' scheme. A theory of optical generation of THz radiation in bulk semiconductors and QW's has been developed to explain the experimental results of other groups. A major achievement has been the development of a rigorous theory for a group of phenomena commonly known as 'lasing without inversion'. For the first time we have developed expressions for threshold and slope efficiency and have come to conclusion that at least for our case of interest-quantum-confined semiconductor structures 'lasing without inversion' does not offer any advantage over more conventional schemes.

DTIC

Semiconductor Devices; Optical Properties; Electromagnetic Properties; Photoconductivity; Photoluminescence

19980010917 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Conformation of Polyaniline: Effect of Mechanical Shaking and Spin Casting

Feng, J., Ohio State Univ., USA; MacDiarmid, A. G., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 4p; In English

Contract(s)/Grant(s): N00014-95-1-0302; N00014-92-J1369

Report No.(s): AD-A330203; TR-P298; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We find from diffuse reflectance Vis/UV spectral studies of polyaniline (emeraldine base; EB) powder doped with camphor-sulfonic acid (HCSA) that the free carrier tail characteristic of an extended coil conformation appears and increases gradually on mechanical shaking with KBr powder. We also find that the forces present during spin-casting of EB films have a significant effect on the value of the absorption maximum of the exciton peak.

DTIC

Shaking; Casting; Doped Crystals; Potassium Bromides; Diffuse Radiation; Powder (Particles)

19980010918 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Exciplex Emission in Bilayer Polymer Light-Emitting Devices

Gebler, D. D., Ohio State Univ., USA; Wang, Y. Z., Ohio State Univ., USA; Blatchford, J. W., Ohio State Univ., USA; Jessen, S. W., Ohio State Univ., USA; Sep. 20, 1997; 15p; In English

Contract(s)/Grant(s): N00014-95-1-0302; N00014-92-J-1369

Report No.(s): AD-A330200; TR-P304; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Photoluminescent and electroluminescent studies of bilayer heterojunctions formed from a poly(pyridyl vinylene phenylene vinylene) (PPyVPV) derivative and poly(vinyl carbazole) (PVK) show an emission peak which cannot be ascribed to either the PPyVPV derivative or PVK layer. Through studies of absorption and photoluminescence excitation (PLE) spectra we demonstrate that the additional feature results from an exciplex at the bilayer interface. The photoluminescence efficiency of the exciplex is

greater than 20%. The electroluminescence spectrum from the bilayer devices is entirely due to exciplex emission, with internal efficiencies initially achieved exceeding 0.1%.

DTIC

Photoluminescence; Electroluminescence; Phenyls; Polymers; Light Emitting Diodes; Heterojunctions; Excitation

19980010919 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Simulations of the In Situ Cyclic Voltammetry Dependent EPR Spectra and DC Conductivity

Wei, X. L., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 4p; In English
Contract(s)/Grant(s): N00014-95-1-0302

Report No.(s): AD-A330197; TR-P287; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In Situ cyclic voltammetry (CV) dependent EPR and DC conductivity of polyaniline have been reported by many groups. However, the variation of the EPR intensities at two half-wave potentials of the CV scan and the asymmetric CV dependent DC conductivity have remained to be fully accounted for. Here we present in detail a novel quasi-random oxidation model and the related simulation results to interpret the reported in situ experimental results. This model quantitatively describes many phenomena and physical properties found in polyaniline including the origin of the defect states, the variations of the in situ EPR signal during CV potential scan, the effects of the hydrolysis, and the pH-dependent DC conductivity data. The statistical nature of this model suggests its general applicability to the oxidation processes of other conducting polymers. The important roles of nearest neighbor Coulomb interaction and formation of a metallic polaron lattice in the computer remodeling are evaluated and discussed.

DTIC

Computerized Simulation; Conducting Polymers; Polymers; Direct Current; Asymmetry

19980010920 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Application of Thin Films of Polyaniline and Polypyrrole in Novel Light-Emitting Devices

MacDiarmid, A. G., Ohio State Univ., USA; Epstein, A. J., Ohio State Univ., USA; Sep. 20, 1997; 23p; In English
Contract(s)/Grant(s): N00014-95-1-0302; N00014-92-J-1369

Report No.(s): AD-A330195; TR-P281; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Light-emitting electroluminescent devices are described in which the conjugated light emitting polymer is separated from one or both of the device electrodes by a film of non-conducting polyaniline. Novel electrochemically-driven electroluminescent devices are also described. The effect on the properties of polypyrrole or polyaniline (deposited from aqueous polymerizing solutions of the monomer) caused by the hydrophilicity/hydrophobicity of the substrate surface is utilized by a 'microcontact printing' technique to form patterned liquid crystal display devices.

DTIC

Thin Films; Polymers; Pyrroles; Electroluminescence; Electrodes; Aqueous Solutions

19980010921 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Pyridine-Based Conjugated Polymers: Photophysical Properties and Light-Emitting Diodes

Epstein, A. J., Ohio State Univ., USA; Wang, Y. Z., Ohio State Univ., USA; Jessen, S. W., Ohio State Univ., USA; Blatchford, J. W., Ohio State Univ., USA; Gebler, D. D., Ohio State Univ., USA; Sep. 20, 1997; 14p; In English
Contract(s)/Grant(s): N00014-95-1-0302; N00014-92-J-1369

Report No.(s): AD-A330192; TR-P279; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We study the photophysical properties of the pyridine-based polymers poly (p-pyridyl vinylene) (PPyV) and poly (p-pyridine) (PPy). The primary photoexcitations in the pyridine-based polymers are singlet excitons. We observe direct intersystem crossing (ISC) on picosecond timescales with the volume density of triplet excitons varying with the sample morphology (film or powder). These effects are demonstrated clearly by examining the millisecond photoinduced absorption characteristics of powder and film forms of PPyV. The pyridine-based polymers have been shown to be promising candidates for polymer light-emitting devices both the 'conventional' diode device and symmetrically configured ac light-emitting (SCALE) device. Here we examine the role of 'insulating' layers and their interfaces with the emitting layer and electrodes in the SCALE device operation with emphasis on the central role of the polymer-polymer interfaces.

DTIC

Light Emitting Diodes; Polymers; Photoexcitation; Excitons; Pyridines; Powder (Particles)

19980010924 Federal Aviation Administration, Office of Aviation Research, Washington, DC USA

A Fuel Generation Model for Char Forming Polymers in Fires Final Report

Lyon, Richard E., Federal Aviation Administration, USA; Aug. 1997; 24p; In English

Report No.(s): AD-A331657; DOT/FAA/AR-97/3; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A mass loss model for char forming polymers in fires is developed from mechanistic pyrolysis kinetics. Under conditions of flaming combustion the coupled rate equations for thermal degradation products and reactants reduce to a single rate law for the residual mass. Exact results are obtained from the mass loss history which include an equilibrium char yield whose value depends only on the relative rates of gas and char formation at a particular temperature. Reaction rate constants for thermolysis of chemical bonds, gas production, and char formation are determinable from parametric fits of the mechanistic charring model to thermogravimetric data. Predictions of the nonisothermal mass loss during constant heating rate experiments are in agreement with experimental data over the expected range of validity.

DTIC

Models; Fuel Consumption; Phenolic Resins; Fire Control

19980010977 Massachusetts Univ., Dept. of Chemistry, Lowell, MA USA

Dispersions of Electroabsorption Susceptibilities: Application to a Polymeric Langmuir-Blodgett Film, 1 Jun. 1997 - 30 Sep. 1998

Yang, K., Massachusetts Univ., USA; Cheong, D. W., Massachusetts Univ., USA; Tripathy, S., Massachusetts Univ., USA; Kumar, J., Massachusetts Univ., USA; Nov. 24, 1997; 21p; In English

Contract(s)/Grant(s): N00014-90-J-1148

Report No.(s): AD-A331961; Rept-1148-96-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The relation between the dispersions of nonlinear optical susceptibilities $X(n)(w;w,0...0)$ and $X(n-1)(w;w,0...0)$ (for electro-optic process) of organic polymeric materials is studied based on the premises that the microscopic polarizabilities $a, b, g, d, ...$ are derivatives of their next lower order polarizabilities, with respect to the effective internal field F across the polarizable p-conjugated systems, and that these derivative relationships are still valid when dynamic (frequency-dependent) processes are considered. Electroabsorption spectroscopy has been used to determine the dispersion of $X113(2)$ and $X113(3)$ of a polyamic acid salt Langmuir-Blodgett film containing covalently bonded azobenzene NLO chromophores. The results are consistent with our prediction, and confirm the validity of the derivative relationships proposed by Marder et al. This LB film also gives appreciable values of both $X113(2)$ (26 pm/v) and $X113(3)$ (2×10^{11} (exp -11) esu).

DTIC

Optical Materials; Polymeric Films; Langmuir-Blodgett Films

19980011510 Massachusetts Univ., Dept. of Chemistry, Lowell, MA USA

Optical Properties of Distyrylbenzene Chromophores and Their Segmented Copolymers, 1 Jun. 1997 - 30 Sep. 1998

Benfaremo, N., Massachusetts Univ., USA; Sandman, D. J., Massachusetts Univ., USA; Tripathy, S., Massachusetts Univ., USA; Kumar, J., Massachusetts Univ., USA; Yang, K., Massachusetts Univ., USA; Rubner, M. F., Massachusetts Univ., USA; Lyons, C., Massachusetts Univ., USA; Dec. 08, 1997; 8p; In English

Contract(s)/Grant(s): N0014-95-1-1292

Report No.(s): AD-A332760; TR-97-02; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A new segmented polymer (3) consisting of a distyrylbenzene chromophore separated by polyethylene glycol segments has been prepared by two independent methods: a novel, polymer analogous Mitsunobu reaction and conventional double displacement reaction. The polymer is soluble in a variety of organic solvents, forms excellent, optically clear films and exhibits strong fluorescence. The properties of the chromophore and the polymer, as well as the scope and limitations of the novel Mitsunobu polymerization are presented. Attempts to use polymer (3) in electroluminescent devices are also discussed.

DTIC

Chemical Reactions; Optical Properties; Polymerization; Polymers; Polyethylenes; Segments

19980011511 Massachusetts Univ., Dept. of Chemistry, Lowell, MA USA

Design, Methodology and Preparation of Novel Polymers for Nonlinear Optics, 1 Jun. 1997 - 30 Sep. 1998

Chittibabu, K. G., Massachusetts Univ., USA; Li, L., Massachusetts Univ., USA; Balasubramanian, S., Massachusetts Univ., USA; Wang, X., Massachusetts Univ., USA; Sukwattanasinitt, M., Massachusetts Univ., USA; Dec. 08, 1997; 8p; In English

Contract(s)/Grant(s): N0014-95-1-1292

Report No.(s): AD-A332762; TR-97-03; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

One-pot post-polymerization modification reactions such as azo-coupling and tricyanovinylolation reactions were employed to synthesize a series of polymers containing different nonlinear optical (NLO) chromophoric as well as ionic functionalities. We have extended and established the versatility of our earlier reported post-modification strategy to incorporate various heteroaromatic chromophores as well as ionic functionalities in the polymers, at the final stage of synthesis. The correlation between differ-

ent heteroaromatic chromophore structures and the NLO properties of the polymers was extensively studied, Polymers containing heteroaromatic chromophores exhibit improved temporal stability and enhanced NLO activity. Polymers with ionic chromophores were employed to fabricate NLO active ultra-thin films using electrostatic self-assembling (ESA) technique. Attempts were also made to synthesize second order NLO active polydiacetylene derivatives using post azo-coupling reaction.

DTIC

Polymerization; Nonlinear Optics; Polymers; Azo Compounds; Chromophores; Electrostatics; Derivation

19980011526 NERAC, Inc., Tolland, CT USA

Recycling Plastics and Polymeric Wastes. (Latest citations from the Ei Compendex*Plus database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851298; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the recycling and uses of plastic and polymeric scraps and wastes. Topics include comminution or grinding of scrap, degradation by heat or chemical reaction, compatibility of various plastics with one another, sorting problems, physical properties of reprocessed materials, economics, public awareness, waste minimization, waste re-use, and foreign experience in plastics recycling. New products made from recycled materials, and products expressly made to be recyclable are also discussed.

NTIS

Recycling; Plastics; Polymer Chemistry

19980011528 NERAC, Inc., Tolland, CT USA

Coating Adhesion Testing. (Latest citations from the INSPEC Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851249; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning adhesion analysis, evaluation, and testing of coatings and films on metal and non-metal substrates. References to spectroscopic and acoustic emission analyses, polymer and metal coatings, scratch tests, mechanical and chemical adhesion properties, adhesion failures and defects, and wear-resistant coatings are presented. Methods of coating are discussed, including sputtering, thermal spray, vapor deposition, and electroless types.

NTIS

Adhesion Tests; Protective Coatings; Evaluation; Performance Tests; Metal Coatings

19980011530 NERAC, Inc., Tolland, CT USA

High Performance Elastomers. (Latest citations from the Rubber and Plastics Research Association Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851207; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the properties and applications of high performance elastomers. Materials discussed include fluorosilicone rubber, urethanes, flexomers, polyolefins, polyphosphazenes, hydrogenated elastomers, polymer alloys, fluorocarbon elastomers, and caprolactones. Hardness, heat resistance, flame resistance, radiation resistance, and processability are among the properties discussed. Applications include shock absorbers, encapsulants, pressure sensitive adhesives, and electrical and electronic parts. Market projections and life prediction testing techniques for small and large parts are included.

NTIS

Bibliographies; Elastomers; Polyurethane Resins; Thermosetting Resins; Life (Durability); Thermal Resistance; Performance Tests

19980011539 NERAC, Inc., Tolland, CT USA

Reinforced Concrete: Polypropylene, Polyethylene or Nylon . (Latest citations from Engineered Materials Abstracts)

Nov. 1997; In English; Page count unavailable.

Report No.(s): PB98-850738; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning strong and lightweight reinforcements for concrete. Synthetic fibers, polyethylene, polypropylene, and nylon are some of the materials detailed. The strengths, properties, and behaviors of unreinforced and reinforced concrete are also discussed.

NTIS

Bibliographies; Concretes; Reinforcing Materials; Synthetic Fibers

19980011655 Warner Robins Air Logistics Center, Robins AFB, GA USA

F-15 Fuel Tank Sealant Final Report

Apr. 30, 1993; 10p; In English

Report No.(s): AD-A331724; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The F-15 wing is a source of constant maintenance because of chronic, recurring leaks from the integral fuel tank. F-15 engineering has evaluated several different concepts, in parallel with this PRAM project, to determine the most effective methods in eliminating this problem. This PRAM project involved applying an Improved Sealing Process (ISP), developed by McDonnell Douglas, to the inside of the integral wing tank. The process applied a sprayable sealant barrier along with the existing channel groove seal. Unlike a bladder, this sealing process covers only potential leak paths such as fasteners and structural joints. The total project cost was \$152,300. Other efforts initiated in conjunction with the PRAM project included implementing a similar sealant barrier applied with a brush, specifying an improved channel groove sealant, and completely revising the integral wing fuel tank sealing technical data. The ISP process was prototyped at Warner Robins on four programmed depot maintenance (PDM) wings. The ISP was successfully prototyped, and the wings were placed in service on four separate aircraft. The aircraft were evaluated in the field for approximately 1 year, and the results indicated leaks on all wings. There was no conclusive evidence showing that the ISP was significantly better than conventional sealing methods. With the test results being less than desired, implementation is not recommended due to the limited benefits of the ISP being greatly outweighed by the cost of equipment, facility allocation, environmental concerns, and PDM schedule impact.

DTIC

F-15 Aircraft; Fuel Tanks; Sealers

19980011683 Manchester Univ., Inst. of Science and Technology, UK

Environmental Interactions and Fracture in Polymer-Matrix Composites Final Report, 1 Oct. 1991 - 30 Sep. 1997

Newman, Roger C., Manchester Univ., UK; Lyon, Stuart B., Manchester Univ., UK; Dec. 1997; 16p; In English

Contract(s)/Grant(s): N00014-92-J-1068

Report No.(s): AD-A332954; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project was concerned with the link between transport and fracture in composite materials with emphasis on degradation of properties on aqueous exposure. The dependence of transport and fracture on volume fraction of a particulate filler was considered in terms of the percolation properties of the connected and unconnected particles. This report describes: validation of the percolation approach; mechanical properties and effect of water absorption; electrical and gravimetric measurements; and ternary composites with glass and rubber.

DTIC

Polymer Matrix Composites; Fracturing; Degradation

19980011989 Massachusetts Univ., Dept. of Chemistry, Lowell, MA USA

Photofabrication of Surface Relief Gratings Using Post Functionalized Azo Polymers, 1 Jun. 1997 - 30 Sep. 1998

Tripathy, S. K., Massachusetts Univ., USA; Kumar, J., Massachusetts Univ., USA; Kim, D. Y., Massachusetts Univ., USA; Jiang, X., Massachusetts Univ., USA; Wang, L. Li, Massachusetts Univ., USA; Sukwattanasinitt, M., Massachusetts Univ., USA; Sandman, D. J., Massachusetts Univ., USA; Dec. 11, 1997; 12p; In English

Contract(s)/Grant(s): N00014-95-1-1292

Report No.(s): AD-A332766; TR-97-04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A series of azobenzene functionalized polymers has been synthesized by post polymerization azo coupling reaction. Photofabrication of surface relief gratings were studied on the polymer films. Epoxy based azo polymers were prepared by post azo coupling reaction to form polymers containing donor-acceptor type azo chromophores. The azo chromophores were designed to contain ionizable groups to impart self-assembling and photoprocessing capabilities to the polymers. The polymers containing 4-(4-(carboxylic acid)phenylazo)aniline chromophores can be directly photofabricated to form surface relief gratings with large surface modulations. Charge interactions had a strong influence on the details of the writing process. A new soluble polydiacety-

lene, post-functionalized with azobenzene groups was also prepared. Large amplitude surface grating could be fabricated on this polydiacetylene films as well.

DTIC

Azo Compounds; Polymerization; Carboxylic Acids; Fabrication; Epoxy Resins

19980011998 University of Southern Mississippi, Dept. of Chemistry, Hattiesburg, MS USA

Propagating Polymerization Fronts *Final Report, 30 Sep. 1994 - 29 Sep. 1997*

Pojman, John J., University of Southern Mississippi, USA; Nov. 18, 1997; 12p; In English

Contract(s)/Grant(s): F49620-94-I-0459; AF Proj. 3484

Report No.(s): AD-A332820; AFOSR-97-0722TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have determined the factors that affect front velocity, conversion and molecular in frontal polymerization with liquid monomers and made some progress with solid monomer systems. We developed the first binary system, consisting of acrylate polymerization via a free-radical mechanism and the curing of an epoxy resin. A full IPN is produced. We also prepared the first frontal polymer dispersed liquid crystal (PDLC) material. We developed a method to suppress convective instabilities via tube rotation and have determined the critical conditions affecting ascending front stability with respect to natural convection. We have studied the frontal curing of DEGEBA epoxy resin. We developed new method to prepare functionally gradient materials.

DTIC

Acrylates; Epoxy Resins; Functionally Gradient Materials; Liquid Crystals; Monomers; Polymerization

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PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers; their storage and handling procedures; and aircraft fuels. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 44 Energy Production and Conversion.

19980009148 NERAC, Inc., Tolland, CT USA

Hydrogen Storage as a Hydride. (Latest Citations from the Aerospace Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867288; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the storage of hydrogen in various metal hydrides. Binary and intermetallic hydrides are considered. Specific alloys discussed are iron-titanium, lanthanum-nickel, magnesium-copper, and magnesium-nickel among others. (Contains 50-250 citations and includes a subject term index and title list.) (

NTIS

Bibliographies; Hydrogen; Metal Hydrides; Chemisorption

19980009420 Tennessee Univ. Space Inst., Tullahoma, TN USA

Cascade Arc Studies of Nonequilibrium Hydrogen/Nitrogen Plasma Propellants *Final Report, 15 Sep. 1995 - 14 Sep. 1997*

Keefer, Dennis R., Tennessee Univ. Space Inst., USA; Sep. 12, 1997; 56p; In English

Contract(s)/Grant(s): F49620-94-I-0331

Report No.(s): AD-A330615; AFOSR-TR-97-0403; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A casca de arc facility was developed to study the characteristics of nonequilibrium plasma propellants for electric propulsion applications. The cascade arc was operated with hydrogen arcs at 2.0 and 6.0 psi. Spatially resolved spectral emission data were collected using a two dimensional Optical Multichannel Analyzer (OMA). Electron density was determined by fitting theoretical line profiles to experimentally measured Abel inverted emission line profiles. Radial distributions of plasma temperature also were estimated from Boltzmann plots of spectral line intensity. The measured electron number densities and plasma temperatures were compared to values predicted by nonequilibrium cascade arc simulations using the UTSI Cascade Arc Plasma Simulation (CAPS) code. The simulations underpredicted the peak experimental number densities by as much as an order of magnitude and over predicted peak plasma temperatures by as much as a factor of 2.5. The experimental electric field has been accurately predicted by varying chemical kinetics in the CAPS code. Kinetic models developed at the University of Illinois were found to give the best agreement with the Cascade Arc measurements. Electron number density profiles for simulated ammonia and hydrazine

were also obtained at pressures of 2, 6 and 10 psi. Kinetic models for these mixtures will be evaluated when the CAPS code has been modified to simulate these propellants.

DTIC

Abel Function; Computerized Simulation; Electric Fields; Electron Density (Concentration); Electron Density Profiles; Electron Plasma; Hydrogen Plasma; Line Spectra; Nitrogen Plasma; Nonequilibrium Plasmas

19980009834 NERAC, Inc., Tolland, CT USA

Ethanol from Corn (Latest Citations from the Energy Science and Technology Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868666; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the production of ethanol from corn biomass and applications as a fuel. Articles discuss modeling and economics of ethanol production, transport, and distribution. Examples of existing operations are examined and evaluated for economic efficiency. The citations include evaluations and comparisons of alcohol production from other sources of biomass. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Ethyl Alcohol; Corn; Synthesis (Chemistry); Synthetic Fuels

19980010026 California Inst. of Tech., Dept. of Chemistry, Pasadena, CA USA

Fundamental Studies of a High Energy System Final Report, 1 Jun. 1993 - 31 May 1997

Okumura, Mitchio, California Inst. of Tech., USA; Sep. 23, 1997; 33p; In English

Contract(s)/Grant(s): F49620-93-I-9326; AF Proj. 3484

Report No.(s): AD-A329762; AFOSR-97-0414TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Metal-atom-doped solid hydrogen has shown promise as a High Energy Density Material with greatly improved propulsion properties; however, the production of high concentrations of atoms in a cryogenic medium has been highly problematic. The objective of this contract was to investigate at a fundamental level the intermolecular forces which determine the structure and properties of the dopant atoms in the host matrix. Aluminum atoms in argon clusters provided a model system with which to test theoretical methods being developed at Phillips Laboratory, Edwards AFB. Spectroscopic measurements of these clusters were performed on a new spectrometer developed under the parent contract. Comparisons of the observations with theoretical calculations revealed the inadequacies of many common assumptions and demonstrated the importance of the mixing of electronic states of the atoms in the presence of the perturbing cluster or matrix. These results provided a benchmark for theory and yield important insights into the interpretation of the electronic spectra of doped matrices.

DTIC

Atomic Structure; Intermolecular Forces; Aluminum; Electronic Spectra; Argon

19980010030 Rensselaer Polytechnic Inst., Dept. of Chemical Engineering, Troy, NY USA

Gas-Phase Kinetics Measurements for Underwater Explosives Annual Report, 15 Oct. 1996 - 14 Oct. 1997

Fontijn, Arthur, Rensselaer Polytechnic Inst., USA; Oct. 09, 1997; 4p; In English

Contract(s)/Grant(s): N00014-94-I-0097

Report No.(s): AD-A332053; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

To aid in the development of boron-enhanced fluorinitramino explosives, the kinetics of individual reactions are measured over wide temperature ranges. It is found that the pre-exponentials of rate coefficients of BO reactions tend to be two orders of magnitude smaller than for the AIO reactions with the same oxidants. This may explain why no reaction could be observed between BO and CO₂, k less than $1 \times 10(\exp -14) \text{ cm}^3(\exp 3) \text{ molecule}(\exp -1) \text{ s}(\exp -1)$.

DTIC

Underwater Explosions; Reaction Kinetics; Vapor Phases

19980010187 Phillips Lab., Edwards AFB, CA USA

Solid Propellant Environmental Issues

Le, Minh D., Phillips Lab., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 21-30; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The objective of the Solid Propellant Environmental Issues (SPEI) project is to demonstrate environmentally acceptable technologies that will enhance the continued production of solid rocket motors (SRMs) by complying with current and anticipated environmental regulations. Phase 1 of the project identifies current and anticipated environmental regulations that may affect

SRMs manufacturing in the future and identify emerging process technologies which comply with these regulations. Phase 2 of the project established a baseline database by fabricating an 800-lbs motor using the current manufacturing process. In Phase 3, environmentally acceptable process technologies were evaluated, ranked, and selected for demonstration using criteria developed by the team. The results for Phases 1-3 have previously been presented. This paper will present data obtained to date on Phase 4. In Phase 4, the alternate process technologies were evaluated for compatibility, cleaning effectiveness, and waste minimization/pollution prevention. The best performing candidate for each application area was selected for demonstration. The selected process technologies will be inserted into the baseline manufacturing process from Phase 2. The new manufacturing process will be demonstrated and evaluated through the scale-up and fabrication of two 800-lbs solid rocket motors.

Author

Solid Propellant Rocket Engines; Chemical Cleaning; Compatibility; Performance Tests; Environment Effects; Alternatives; Cleaners; Manufacturing

19980010208 Army Missile Command, Research, Development, and Engineering Center, Redstone Arsenal, AL USA

Recovery and Reuse of Rocket Propellants

Melvin, William S., Army Missile Command, USA; Starling, Jarel P., Army Engineering and Support Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 193-201; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This report describes ongoing process development efforts by the U.S. Army Missile Command (MICOM) to support environmentally safe rocket motor demilitarization demonstrations. This MICOM developed technology is used to recover valuable oxidizer and fuel ingredients from tactical and strategic class 1.1 and 1.3 solid propellants for recycle/reuse. The closed-loop demilitarization method employs liquid ammonia as the processing solvent for ingredient extraction and recovery. A pilot plant facility was designed and constructed in Magna, Utah to demonstrate this Army technology using Multiple Launch Rocket System (MLRS) and Chaparral tactical solid rocket motors. In July 1996, the pilot plant successfully completed full scale MLRS propellant testing in a batch process mode at rates approaching 90 kg (200 lb.) per hour. The facility is currently being relocated to a permanent site at Redstone Arsenal, AL. Once the transition is completed, processing demonstrations using class 1.1 Chaparral rocket motors will be performed. Discussed in this report are process and design considerations defining the operation of the pilot plant facility. Critical equipment and system components for each unit operation are identified. Process descriptions of the integrated class 1.1/1.3 rocket motor demilitarization system involving propellant removal, ingredient extraction, binder separation, oxidizer recovery, and solvent regeneration are provided. Test results demonstrating the ability of energetic products recovered by this process to be recycled into other products, and future work plans to be performed in support of this program also are included.

Author

Materials Recovery; Rocket Propellants; Missiles; Recycling; Reuse; Oxidizers; Liquid Ammonia

19980010212 McDonnell-Douglas Aerospace, Huntsville, AL USA

Advances in Clean Burning Hybrid Rocket Fuels

Dean, David, McDonnell-Douglas Aerospace, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 239-244; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Hybrid rocket propulsion---based on a solid fuel and a liquid oxidizer---is attractive from an environmental as well as a performance standpoint. McDonnell Douglas Aerospace--Huntsville has developed a new hybrid fuel with numerous advantages including: (1) low cost, commercially available, non-energetic ingredients that can be cleaned up without using hazardous solvents and disposed of in regular landfills; (2) a self extinguishing characteristic that keeps the fuel out of the flammable solid category and makes it safe to handle, ship, and store; (3) high efficiency combustion with a clean exhaust when burned in a rocket motor; (4) a higher regression rate, more uniform axial regression, and higher density than existing alternatives, all organic hybrid rocket fuels; and (5) flexible operation during flight due to ability to throttle, shut down, and restart. This paper will discuss the new MDA fuel formulation, highlighting its environmental friendliness, its advantages, and test results obtained in motor firing tests.

Author

Clean Fuels; Hybrid Propulsion; Liquid Oxidizers; Solid Rocket Propellants; Hybrid Propellants; Environment Effects; Hybrid Propellant Rocket Engines

19980010226 Naval Surface Warfare Center, Indian Head Div., Indian Head, MD USA

Supercritical Carbon Dioxide Processing of a Pyrotechnic

Farncomb, R. E., Naval Surface Warfare Center, USA; Naufflett, G. W., Naval Surface Warfare Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 385-390; In English; Also announced as 19980010184; No Copyright;

Avail: CASI; A02, Hardcopy; A06, Microfiche

The magnesium, Teflon, and Viton (MTV) pyrotechnic ignition material has been produced at NSWC/IHD since the early 1950's using the Shock-Gel process. MTV crumb was prepared by slurring magnesium and Teflon in an acetone solution of Viton, followed by drowning the mixture with hexane. Residual acetone was extracted from the MTV crumb with additional hexane washes. The hexane wet MTV crumb was oven dried, extruded and cut to length. The Shock-Gel process generates ten pounds of hazardous waste per pound of MTV produced. The new and improved method for MTV preparation was designated the Super-Shock process. In this process carbon dioxide replaces hexane as the antisolvent. The MTV crumb was extracted with SC-CO₂ to remove trace amounts of acetone thereby eliminating the need for drying prior to extrusion. The Super-Shock process generates essentially no hazardous waste because carbon dioxide, acetone, and out of specification crumb were recycled.

Author

Pyrotechnics; Teflon (Trademark); Viton Rubber (Trademark); Magnesium; Acetone; Carbon Dioxide; Hazardous Wastes; Solvents

19980010583 Colorado Univ., Center for Combustion Research, Boulder, CO USA

Nonsteady Combustion Mechanisms of Advanced Solid Propellants Final Report

Branch, Melvyn C., Colorado Univ., USA; Sep. 01, 1997; 19p; In English

Contract(s)/Grant(s): F49620-93-0430; AF Proj. 3484

Report No.(s): AD-A329767; CCER-97-02; AFOSR-97-0502TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes progress on a collaborative research program combining the expertise of individuals from several universities to develop a new ability to predict the propulsion performance of solid rocket motors. The focus of the research on nonsteady behavior is unique and the overall project is not possible at any one of the institutions participating in this coordinated research. The individual tasks which we are studying will pursue solid propellant decomposition under unsteady conditions, nonsteady aspects of gas phase flame structure measurements, numerical modeling of multidimensional flame structure, propellant/flame interactions and overall nonsteady propellant combustion characteristics in realistic rocket motor environments. Our goal has been to develop general models of fundamental mechanisms of combustion instability that can be applied to a variety of new energetic materials.

DTIC

Combustion Stability; Solid Propellants; Propellant Decomposition; Propulsion System Performance

19980010825 NERAC, Inc., Tolland, CT USA

Solid Rocket Engine Propellants. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English

Report No.(s): PB96-866090; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, development, testing, and evaluations of solid propellants for rocket engines. Topics include metallized propellants, plasticizers, burning rates and enhancers, binders, propellant grains, and propellant aging and storage life. Environmental impact and protection are examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Solid Rocket Propellants; Bibliographies; Environment Protection

19980010862 NERAC, Inc., Tolland, CT USA

Aluminized Propellants and Explosives. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English

Report No.(s): PB96-866116; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the compositions and preparations of stable, high energy aluminized propellants and explosives. Compositions include aluminum powders and flakes, aluminum oxides, aluminum hydrides, and whiskers. Patents cover ultra-high burning rate propellants, stabilization of aluminum hydrides, sensitizing agents for explosives, low radar attenuation propellants, and anti-erosive rocket propellants.

NTIS

Aluminum Hydrides; Aluminum Oxides; High Energy Propellants; Metal Propellants; Powdered Aluminum; Propellant Additives; Rocket Propellants

19980010912 Mitre Corp., Jason Program Office, McLean, VA USA

High Energy Density Explosives

Lewis, N., Mitre Corp., USA; Garwin, R., Mitre Corp., USA; Hammer, D., Mitre Corp., USA; Happer, W., Mitre Corp., USA; Jeanloz, R., Mitre Corp., USA; Oct. 08, 1997; 24p; In English

Report No.(s): AD-A331439; JSR-97-110; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A JASON summer study was performed to assess the status of ongoing research programs in the area of energetic materials. The goal of this study was to examine the current status of work in the area of energetic materials in order to provide DARPA with a technical evaluation of which, if any, research approaches have the potential to produce significant advances in the state of the art of this area.

DTIC

Explosives; Bombs (Ordnance)

19980010913 California Univ., Dept. of Chemistry, Irvine, CA USA

Advance Cryogenic Propellants Final Report, 14 Apr. 1993 - 14 Apr. 1997

Apkarian, V. A., California Univ., USA; Gerber, R. B., California Univ., USA; Janda, K. C., California Univ., USA; Rutledge, J., California Univ., USA; Taborrek, P., California Univ., USA; Apr. 1997; 30p; In English

Contract(s)/Grant(s): F49620-93-I-0251; AF Proj. 3484

Report No.(s): AD-A331450; AFOSR-97-0576TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The applied ends of the URI on advanced cryogenic propellants, namely the feasibility of preparing cryogenic materials with higher energy density than systems presently in use, have been met with two examples: solid hydrogens doped with atomic oxygen, and solid oxygen doped with atomic oxygen. Both of these systems have been demonstrated in the laboratory, and in the latter case, where doping number densities of order 1% have been achieved, a patent has been filed on the "Method for producing High Energy Density Cryogenic Fuel". Additionally, methods of characterization, including quantitative calorimetry and spectroscopy, have been devised and implemented. The original proposal recognized the need for developing a fundamental scientific basis for such intended applications. There has been significant progress in this regard, developments that go beyond the immediate target of the URI. Practical methods for computation of energetics and dynamics in quantum hosts, and quantum many-body dynamics in extended systems, were developed and successfully applied. The rheology of solid hydrogens was studied, and characterized. Time resolved spectroscopic methods were devised and implemented to demonstrate that microscopic details inaccessible in frequency domain spectroscopy of condensed media, could be unraveled with unprecedented detail.

DTIC

Additives; Characterization; Cryogenic Rocket Propellants; Cryogenics; Progress; Rheology; Solidified Gases; Spectroscopy

19980010969 Naval Weapons Support Center, Crane, IN USA

Technical Evaluation of the Simulator, Flare SM-875A/ALE Final Report

Lueking, James R., Naval Weapons Support Center, USA; Jul. 1997; 49p; In English

Report No.(s): AD-A331524; NSWCCR/RDTR-97/21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report covers the Technical Evaluation of the Simulator, Flare SM-875A/ALE. The design and development of the Simulator was completed and the Technical Evaluation Test Program is hereby reported with conclusions and recommendations for production and service of this Simulator for Decoy Flares. The use of these low cost simulators should result in considerable savings to the fleet during aircraft crew training. The Technical Evaluation Test Program provides assurance of the safety and reliability of the Simulator and a recommendation for release to production. This product improvement uses more plastic parts including a biodegradable candle housing.

DTIC

Simulators; Decoys; Flares

19980011529 NERAC, Inc., Tolland, CT USA

Ammonium Nitrate Explosives. (Latest citations from the Energy Science and Technology Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851223; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the use of ammonium nitrates as a component for explosives. Articles discuss chemical formulations, reactions, and by-products. Typical applications include quarrying and mining, destruction of industrial wastes, and military and space propellants.

NTIS

Explosives; Bibliographies; Chemical Reactions; Technologies; Ammonium Nitrates

19980011532 NERAC, Inc., Tolland, CT USA

Deflagration to Detonation Transition in Explosive Materials. (Latest citations from the NTIS Bibliographic Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851140; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This bibliography contains citations concerning the propagation of an explosive front in propellants and explosives after ignition. This deflagration-to-detonation transition (DDT), is discussed for a variety of materials, including solids, liquids, and gases. DDT for materials is discussed from the viewpoints of porosity, flame spread, shock wave propagation, pressure rise, crack formation, and crack propagation. Mechanisms and models for DDT are also discussed, as well as applications to devices such as detonators, rockets, and explosive munitions. Propellants and explosives in general are referenced in related published bibliographies.

NTIS

Deflagration; Explosives; Detonators; Ignition

19980011599 NERAC, Inc., Tolland, CT USA

Handwritten Chinese and Japanese Character Recognition by Computers. (Latest citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867668; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning online and interactive recognition of handwritten Chinese and Japanese characters. Topics include neural networks, matching and optimization processes, model-based and knowledge-based systems, image segmentation, graph theory, and image reconstruction. Citations concerning handwritten information recognition by computers, and computer translation of Chinese and Japanese languages are covered in other bibliographies.

NTIS

Bibliographies; Handwriting; Character Recognition; Angular Resolution

19980011985 NERAC, Inc., Tolland, CT USA

Electroexplosive Devices. (Latest citations from the NTIS Bibliographic Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851215; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, testing, and reliability of electroexplosive devices. Explosive initiators, detonators, and firing circuits are discussed. Topics include dielectrics and semiconductors of various configurations, devices that are immune to radio frequencies, protection against direct currents, and electromagnetic compatibility. Applications in mining and oil drilling, weapon systems, and guided missiles are examined.

NTIS

Bibliographies; Initiators (Explosives); Design Analysis; Fabrication; Performance Tests; Reliability Analysis

19980011988 Army Research Lab., Aberdeen Proving Ground, MD USA

Oscillations on Electrothermal-Chemical (ETC) Closed-Chamber JA2 Burn-Rate Reductions Final Report, Apr. 1995 - Feb. 1997

Guercio, Miguel D., Army Research Lab., USA; Dec. 1997; 90p; In English

Contract(s)/Grant(s): DA Proj. 1L1-62618-AH-75

Report No.(s): AD-A332782; ARL-TR-1572; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Closed-chamber electrothermal-chemical firings of JA2 7-perf propellant revealed the presence of oscillations on its burn rates. This study was originated by questions raised about the probable causes for this phenomena. The discussion that follows analyses the fiber-optic links utilized for the data acquisition, the code used to deduce the propellant burn rate and the filtering for data smoothing, and finally, the effect of the plasma injection and its energy. The result of this analysis suggests that the plasma

injection contributes to burn-rate oscillations, that their amplitude is proportional to the energy of the plasma injected, and that the oscillations are a function of the closed-chamber pressure.

DTIC

Burning Rate; Oscillations; Solid Propellants; Plasmas (Physics); Combustion Chambers

19980012001 Army Research Lab., Weapons and Materials Research Directorate, Aberdeen Proving Ground, MD USA

Effect of Propellant Grain Dimensions on Progressivity Final Report, period ending Aug. 1996

White, Kevin J., Army Research Lab., USA; Oct. 1997; 52p; In English

Contract(s)/Grant(s): DA Proj. 1L1-62618-A1-FL

Report No.(s): AD-A331744; ARL-TR-1532; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

For high loading density propelling charges, propellant grain geometry design is employed to improve ballistic efficiency. Specifically, grains that have 7, 19 and even 37 perforations are used. These grains all have progressive geometries, i.e., surface areas that increase as the propellant burns. This report studies the effect of grain dimensions on progressivities of the 7- and 19-perforation geometries. Calculations show that for maximum progressivity, the ratio of grain diameter to perforation diameter should be as large as practical. It is shown that small values can degrade potential gun performance. Calculations also show that the grain length-to-diameter ratio should be at least between 1 and 2 for maximum progressivity. This effect is very nonlinear, and values less than 1 are shown to reduce progressivity and gun performance significantly. High-progressivity geometries have, however, an undesirable effect on ballistic temperature sensitivity and yield an increased sensitivity to propellant manufacturing variability.

DTIC

Propellant Grains; Ballistics

31

ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; cryogenics; and fire prevention.

19980009136 National Inst. of Standards and Technology, Gaithersburg, MD USA

Fire Hazard Assessment Methodology

Jones, W. W., National Inst. of Standards and Technology, USA; Jun. 1996; 12p; In English

Report No.(s): PB97-140552; NISTIR-5836; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Hazard 1 is a prototype of a general purpose fire hazard assessment method. The scope of a general purpose fire hazard assessment method. The scope of this prototype, its data base, and the example cases are focused on single family residential occupancies. The methodology consists of a set of procedures combining expert judgement and calculations to estimate the consequences of a specified fire. These procedures involve four steps: (1) defining the context, (2) defining the scenario; (3) calculating the hazard, and (4) evaluating the consequences. The core of HAZARD 1 is a sequence of conditions over time, calculate the time needed by building occupants to escape under those conditions, and estimate the resulting loss of life based on assumed occupant behavior and tenability criteria.

NTIS

Fires; Fire Prevention; Fire Damage; Hazards

19980009237 NERAC, Inc., Tolland, CT USA

Cutting Fluids for Grinding, Milling, and Machining of Metals and Minerals (Latest Citations from the Ei Compendex*Plus Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869722; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning research, developments, and uses of cutting fluids/coolants for grinding, milling, and machining of metals and minerals. Tribological characteristics of cutting fluids, occupational health hazards, treatment of used coolants, and water jet cutting are included. Performance evaluations of various fluid compositions are examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Coolants; Cutting; Fluids

19980009271 New Mexico Univ., Center for Global Environmental Technologies, Albuquerque, NM USA

Development of Alternative, Non-Halon Fire Protection System Final Report, Sep. 1993 - Dec. 1995

Patterson, R. A., New Mexico Univ., USA; Gobeli, G., New Mexico Univ., USA; Tapscott, R. E., New Mexico Univ., USA; DiNunno, P. J., Hughes Associates, Inc., USA; Feb. 1997; 218p; In English

Contract(s)/Grant(s): EPA-68-D3-0141

Report No.(s): PB97-147961; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report describes the effort to identify, test, and assess a system to extinguish fires using a technology that does not require a halocarbon extinguishing agent. Recently, two alternative technologies--water mist system (WMS) fire suppression technologies and low-residue particulate (LRP)--have come to the attention of researchers. These technologies allow the use of water or dry chemicals in reduced quantities to provide acceptable fire protection. The project reviewed the technologies of WMSs and low-residue particulate systems with regard to fire protection. The state-of-the art was evaluated in view of the current technology and the potential for near-term improvements. Based upon the results of the information search and the assessment of the state-of-the-art for water mist fire suppression systems (WMSs) and LRPs, WMS was recommended as the most promising near-term technology for evaluation of this experimental program. The experimental program was to define and optimize the operating parameters for a WMS at laboratory scale, followed by system development studies, and room-scale testing. Based upon the success of this effort, the final project task was an engineering design and cost comparison of WMSs with respect to the equivalent as halon system.

NTIS

Fire Extinguishers; Environment Effects; Fire Prevention; Alternatives; Water; Extinguishing; Halocarbons

19980009279 Texas Univ., Center for Transportation Research, Austin, TX USA

Use of Waste Toner in Asphaltic Concrete Final Report

Solaimanian, M., Texas Univ., USA; Kennedy, T. W., Texas Univ., USA; McGennis, R. B., Texas Univ., USA; Feb. 1997; 65p; In English

Report No.(s): PB97-179402; CTR-3933-1F; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Every year, a tremendous amount of toner is produced for copiers and printers by toner manufacturing companies throughout the USA. Some of this toner does not meet quality specifications and consequently becomes a waste product of the manufacturing process. This manufacturing waste, along with the spent toner (residue) from copiers and printer cartridges, is dumped into landfills for lack of a better way of utilizing the material. A cooperative research project undertaken by the Texas Department of Transportation and The University of Texas at Austin investigated the feasibility and potential benefits of utilizing waste toner in hot-mix asphalt concrete. The research program included procuring a number of different waste and spent toners, blending them with asphalt cement at different ratios, and evaluating the binder and mixtures properties resulting from the waste toner addition.

NTIS

Landfills; Manufacturing; Printers; Reproduction (Copying); Residues; Solid Wastes; Waste Disposal; Waste Management

19980009333 Los Alamos National Lab., NM USA

An experimental investigation of an air cooling scheme for the multichip modules of the multiplicity and vertex detector

Bernardin, J. D., Los Alamos National Lab., USA; Bosze, E., Los Alamos National Lab., USA; Boissevain, J., Los Alamos National Lab., USA; Simon-Gillo, J., Los Alamos National Lab., USA; Jul. 1997; 31p; In English

Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-13320-MS; DE97-008404; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report presents a summary of an experimental investigation of an electronics air cooling system for the multiplicity and vertex detector (MVD), a device used to determine and characterize the collision location of two accelerated heavy ions. Measurements of the flow rates of the cooling air and the temperatures of the air and electronic components were used to assess and optimize the performance of the proposed air cooling system, identify potential assembly problems and system limitations, and provide the necessary information for designing and sizing the final MVD cooling system components.

DOE

Forced Convection; Microelectronics; Air Cooling; Cooling Systems

19980009530 Maine Univ., Dept. of Mechanical Engineering, Orono, ME USA

Intermodule Connector Technology for Mobile Offshore Base Structures Annual Report, May - Sep. 1997

Sep. 1997; 4p; In English

Contract(s)/Grant(s): N00014-97-I-0661

Report No.(s): AD-A330599; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objectives for the work under this grant continue to be: (1) Determination of design requirements for Mobile Offshore Base (MOB) connectors and development of accurate, reliable predictions of connector performance; (2) Further development of concepts for flexible intermodule connectors and evaluation using computational modeling; and (3) Proof of concept for selected configurations through fabrication and scale model testing of most promising connector concepts.

DTIC

Marine Technology; Offshore Platforms; Scale Models

19980009805 NERAC, Inc., Tolland, CT USA

Diamond Uses in Drilling and Mining Operations. (Latest Citations from the Ei Compendex*Plus Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866884; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design and performance evaluation of diamond cutting and drilling tools produced for mining and well applications. Wear and efficiency characteristics of polycrystalline diamond compact (PDC) drill bits are discussed.

NTIS

Cutters; Data Bases; Diamonds; Evaluation; Machine Tools; Mining; Performance Tests; Polycrystals

19980009832 NERAC, Inc., Tolland, CT USA

Semi-solid Processing of Materials. (Latest Citations from METADEX)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865142; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning semi-solid forming, casting, forging, and molding of alloy and composite materials. Manufacturing methods, equipment, material properties, and material testing methods are discussed. Also covered are specific applications and markets, including the automotive industry.

NTIS

Automobiles; Manufacturing; Market Research

19980009835 NERAC, Inc., Tolland, CT USA

Scarfig (Latest Citations from METADEX)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-858915; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning thermochemical and gas scarfig. Topics include surface finishing, descaling, use of metallic powders, cutting, and methods and apparatus. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Scarfig; Thermochemistry

19980010002 National Inst. of Standards and Technology, Gaithersburg, MD USA

Project Summaries 1996: NIST Building and Fire Research Laboratory

Raufaste, N. J., National Inst. of Standards and Technology, USA; Sep. 1996; 90p; In English

Report No.(s): PB97-121818; NIST/SP-838-10; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The National Institute of Standards and Technology's (NIST), Building and Fire Research Laboratory (BFRL) is one NIST's seven Laboratories. The mission of BFRL is to enhance the competitiveness of U.S. industry and public safety through performance prediction and measurement technologies and technical advances that improve the life cycle quality of constructed facilities. Constructed facilities include all buildings and their furnishings and the public and private utilities and public works that support business, commerce, industry, and homes. BFRL's efforts are closely coordinated with complementary activities of industry, professional and trade organizations, academe, and other agencies of government. BFRL's research is in the areas of: structural

engineering, materials engineering, mechanical and environmental systems, fire safety and engineering, fire science, and applied economics.

NTIS

Buildings; Fire Prevention; Fires; Structural Engineering; Systems Engineering; Performance Prediction

19980010013 National Inst. of Standards and Technology, Gaithersburg, MD USA

Method for Estimating the Energy Efficiency Ratio of Mixed System Air Conditioners and Heat Pumps

Kim, B. S., National Inst. of Standards and Technology, USA; Domanski, P. A., National Inst. of Standards and Technology, USA; Sep. 1997; 38p; In English

Report No.(s): PB97-211023; NISTIR-6045; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In lieu of testing each split system air conditioner and heat pump combination, an empirically based calculation procedure may be used for estimating a unit's Energy Efficiency Ratio at the 35 deg C (95 deg F) rating condition, EER(95). The procedure accounts for performance changes caused by using different indoor sections with the same condensing unit. The procedure is applicable to all electric units having rated cooling capacities less than 19 kW (65,000 Btu/h) and charged with Refrigerant 22.

NTIS

Air Conditioning Equipment; Refrigerants; Energy Conservation; Condensing; Cooling; Heat Pumps

19980010121 NERAC, Inc., Tolland, CT USA

Natural Gas Transport by Plastic Pipes. (Latest Citations from the Ei Compendex*Plus Database)

Mar. 1996; In English

Report No.(s): PB96-866074; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of plastic piping to transport natural gas or liquid propane gas. The interaction between gas odorants and plastic pipe, the effects of aging on plastic pipe used to transport gas, and pipe failure analyses are examined. Bending, joining, and repair methods are discussed. Composite reinforced plastic pipes and plastic coated pipes are considered. Polyethylene and epoxy composites are among the materials discussed. Gas main upgrading projects that replaced old pipes with plastic ones are briefly cited. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Natural Gas; Bibliographies; Pipelines

19980010244 NASA Marshall Space Flight Center, Huntsville, AL USA

An Interagency Study of Depainting Techniques

Cook, B., NASA Marshall Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 585-590; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Many popular and widely used paint stripping products now contain methylene chloride as their active ingredient. However, the Environmental Protection Agency (EPA) will critically curb the use of methylene chloride under an aerospace national emission standard for hazardous air pollutants (NESHAP) within the next 2-1/2 years. An effort is underway to identify and evaluate alternative depainting technologies emphasizing those believed to be both effective and environmentally benign. On behalf of the EPA and in cooperation with the U. S. Air Force (USAF), the National Aeronautics and Space Administration (NASA) is conducting a technical assessment of nine alternative technologies (i.e.: chemical stripping, two CO₂ blasting processes, FLASHJET(TM) coating removal, laser stripping, plastic media blasting, sodium bicarbonate wet stripping, high-pressure water stripping, and wheat starch blasting). These depainting processes represent five removal method categories, namely abrasive, impact, cryogenic, thermal, and/or molecular bonding dissociation. This paper discusses the test plan and parameters for this interagency study. Several thicknesses of clad and non-clad aluminum substrates were used to prepare test specimens, which have been cut, cleaned, painted, and environmentally aged. Each depainting process has been assigned a specimen lot, which is now undergoing an initial strip cycle. Metallurgical impacts will be determined after these specimens complete five cycles of preparation and stripping.

Author

Paint Removal; Environment Effects; Environment Protection; Air Pollution; Chemical Cleaning; Solvents

19980010246 Battelle Columbus Labs., OH USA

Alternative Coating Removal Methods for Radome Materials

Cundiff, Charles H., Battelle Columbus Labs., USA; Slife, Richard I., Warner Robins Air Logistics Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 599-605; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Warner Robins Air Logistics Center (WR-ALC), like many of its counterparts throughout the DoD, continues to develop viable and effective alternative coating removal methods to replace the methods currently in use. The current methods used by WR-ALC for removal of the protective coatings from radomes are some form of chemical stripping. These chemical stripping processes are based on chemicals that are not considered environmentally safe, such as methylene chloride and methyl ethyl ketone. This paper discusses the initial feasibility testing of several methods that could have the potential to be used as an environmentally acceptable alternative method for use on the radomes that are inspected and repaired by WR-ALC. The successful attainment of the goals of this program includes compliance with WR-ALC production requirements, as well as satisfying weapons systems program directorate constraints regarding possible radome performance degradation produced by an alternative coatings removal process. This paper will present the prospective alternative methods/processes being evaluated, the feasibility test protocol, the WR-ALC acceptance criteria being applied to determine process feasibility, and the interim test results from the on-going feasibility assessments.

Author

Protective Coatings; Radomes; Chemical Cleaning; Environment Effects; Alternatives; Cleaners; Solvents

19980010248 United Space Boosters, Inc., Materials and Processes Lab., Huntsville, AL USA

CST(TM) Spray Process for Environmentally Friendly Coatings

Scarpa, Jack, United Space Boosters, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 615-620; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Conventional spray application processes have poor transfer efficiencies, resulting in extraordinary loss in materials, solvents, and time. With increasing restrictive Environmental Protection Agency (EPA) regulations and Occupational Safety and Health Administration (OSHA) requirements, these processes which significantly impact the amount of materials and solvents that are released into the environment are becoming unacceptable. High solids spray processes are also limited by material viscosity, and may require many passes over the surface to achieve desired thickness which results in high application costs and a negative impact on the environment. Until recently, requirements for a 100% solid sprayable, environmentally friendly, lightweight thermal protection system that can be applied in a thick (greater than 0.125 inch) single-pass operation exceeded the capability of existing systems. Such coatings have been typically applied by hand lay-up techniques, especially for thermal and/or fire protection systems. The current formulation of these coatings presents many potential issues including, environmental hazards, excessive waste, high cost, and application constraints. A system that can apply coatings without using hazardous materials would alleviate many of these issues. Potential applications include the aerospace thermal protective specialty coatings and chemical and petroleum industries fire-protection coatings that resist impact, chemicals, and weather. These markets can be penetrated by offering customized coatings applied by automated processes that are environmentally friendly.

Author

Protective Coatings; Sprayers; Environment Protection; Coating; Spraying

19980010258 NASA Lewis Research Center, Cleveland, OH USA

The Effect of ODC-Free Cleaning Techniques on Bearing Lifetimes in the Parched Elastohydrodynamic Regime

Jones, William R., Jr., NASA Lewis Research Center, USA; Toddy, Thomas J., NASA Lewis Research Center, USA; Predmore, Roamer, NASA Goddard Space Flight Center, USA; Shogrin, Bradley, Case Western Reserve Univ., USA; Herrera-Fierro Pilar, Ohio Aerospace Inst., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 709-721; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

A parched elastohydrodynamic rig was used to determine relative bearing lifetimes as a function of cleaning procedures in a series of accelerated tests. Two ODC-free cleaning procedures (super critical CO₂ and ultraviolet-ozone) were compared to a CFC-113 control. Bearings (52100 steel) were run in the counter rotating mode (equivalent to 4600 rpm) with a full complement (i.e. no retainer) and a single charge of lubricant (Krytox 143 AC). Test conditions included: an air atmosphere, 445N load, approx. 1.0 GPa mean Hertz stress. There was approximately a 50% reduction in life with bearings cleaned with UV/ozone and a 70% reduction in life with SFE CO₂ when compared to the Freon control. Possible reasons for these decreases in lifetimes are presented.

Author

Accelerated Life Tests; Chemical Cleaning; Cleaners; Environment Effects; Service Life; Carbon Dioxide; Elastohydrodynamics; Bearings

19980010945 Concurrent Technologies Corp., Johnstown, PA USA

Powder Coat Applications Final Report, Dec. 1995 - Dec 1996

Docherty, M. J., Concurrent Technologies Corp., USA; Mulkey, F. J., Concurrent Technologies Corp., USA; Sep. 1997; 66p; In English

Report No.(s): PB98-108624; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Current pavement design procedures are based principally on empirical approaches. The current trends toward developing more mechanistic-empirical type pavement design methods led Minnesota to develop the Minnesota Road Research Project (Mn/ROAD), a long-term pavement testing facility. The project consists of 40 heavily instrumented test sections, 14 of which are Jointed Plain Concrete (JPC) designs. Mn/ROAD researchers determine the predicted lives of the concrete test sections by applying design and as-built data to three currently accepted concrete pavement design methods: Minnesota Department of Transportation's rigid pavement design guidelines, AASHTO Guide for Design of Pavement Structures 1993, and the PCA Thickness for Concrete Highway and Street Pavements (1984). The analysis began with determining the applicable as-built parameter values for each respective design method. Applying the as-built parameters to the three methods resulted in widely varied predictions of pavement life. For the 193 AASHTO design method, reliability levels of 50 percent and 95 percent were applied for comparison. An experimental procedure for converting PCA method fatigue and erosion results to AASHTO type CESALS demonstrated unsuitability. Validation of the predictions presented will occur as the test cells reach their terminal serviceability.

NTIS

Test Facilities; Powder (Particles); Pavements; Highways

19980010964 National Center for Physical Acoustics, University, MS USA

Thermoacoustic Engines in Alternate Geometry Resonators Final Report, 1 Aug. 1992 - 14 Sep. 1996

Raspet, Richard, National Center for Physical Acoustics, USA; Bass, Henry E., National Center for Physical Acoustics, USA; Sep. 12, 1997; 150p; In English

Contract(s)/Grant(s): N00014-89-J-3087; N00014-93-1-1125

Report No.(s): AD-A331730; PARGUM/NCPA-LC0997-01; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The purpose of the research reported herein is to branch out from thermoacoustics in the plane wave geometry to study radial wave thermoacoustic engines. Specifically, two possible advantages were sought from radial systems: (1) reduction of harmonic generation due to natural anharmonicity of the resonators and (2) improved engine performance using naturally sloped stacks. Results show that the anharmonicity of the resonator significantly reduces non-linear harmonic generation and that sloped stacks significantly improve the refrigerator coefficient of performance in plane wave systems.

DTIC

Plane Waves; Harmonic Generations; Performance; Resonators; Engine Tests

19980010982 Utah Univ., Salt Lake City, UT USA

Synthesis and Properties of Nine New Polyhydroxylated Surfactants Final Report

Thompson, William B., Utah Univ., USA; Henderson, Thomas C., Utah Univ., USA; Aug. 1997; 5p; In English

Contract(s)/Grant(s): DAAH04-93-G-0420

Report No.(s): AD-A332605; ARO-32367.8-MA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Much military-specific manufacturing involves complex, special purpose electro-optical and electro-mechanical systems where development and fabrication costs can't be spread across high-volume civilian products. Computer vision systems are an important enabling technology for the cost effective, flexible automation needed to produce such systems. Our work focuses on the creation of accurate and usable geometric models of manufactured objects. Such models allow for update of manufacturing processes and easy modification of existing parts. They are also central to emerging technologies such as simulation-based design and virtual prototyping.

DTIC

Electromechanical Devices; Computer Aided Manufacturing; Computer Vision

19980011523 NERAC, Inc., Tolland, CT USA

Silicon Micromachining. (Latest citations from the INSPEC Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851330; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning microstructures and nanostructures fabricated from silicon. Applications of micromachined structures include sensors, optical and mechanical features integrated on silicon chips, beam structures, actuators,

and pneumatic control elements. Micromachining is accomplished by means of anisotropic etching through various control resources such as laser assist, masks, and advanced lithographic techniques.

NTIS

Bibliographies; Micromachining; Silicon; Fabrication; Nanostructures (Devices)

19980011572 University of Central Florida, Dept. of Civil and Environmental Engineering, Orlando, FL USA

Final Report for Analytical and Experimental Investigation of Reinforced Concrete Columns Encased in Fiberglass Tubular Jacket and Use of Fiber Jacket for Pile Splicing

Mirmiran, A., University of Central Florida, USA; Feb. 20, 1997; 182p; In English

Report No.(s): PB97-155584; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The main objective of this study was to evaluate the feasibility of using hybrid columns made of Fiber Reinforced Plastics (FRP) and concrete in the construction of bridge pier columns. The following objectives were also identified: (1) Developing a confinement model that quantifies the benefits of FRP as a confining measure; (2) Perform experimental investigation into eliminating reinforcements from the construct of hybrid columns; and (3) Develop mechanical methods of composite action between FRP and concrete.

NTIS

Glass Fibers; Carbon Fiber Reinforced Plastics; Concrete Structures

19980011594 Oregon State Univ., Transportation Research Inst., Corvallis, OR USA

Crumb Rubber Modifier (CRM) in Asphalt Pavement: Summary of Practices in Arizona, California, and Florida Interim Report, 1 Feb. - 30 Jun. 1995

Hicks, R. G., Oregon State Univ., USA; Lundy, J. R., Oregon State Univ., USA; Leahy, R. B., Oregon State Univ., USA; Hanson, D., Oregon State Univ., USA; Epps, J., Oregon State Univ., USA; Sep. 1995; 110p; In English

Report No.(s): PB96-168802; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Highway agencies have been evaluating crumb rubber modifier (CRM) in hot mix asphalt (HMA) since the 1970's. Three agencies, Arizona, California, and Florida, currently use CRM in HMA at levels that would approach or exceed the mandate in Section 1038 of the Intermodal Surface Transportation Efficiency Act of 1991. This report documents the use of CRM in HMA in these three States. In particular, it addresses issues including thickness design, materials and mix design, construction procedure, including control, and pavement performance. The report also addresses the following questions: (1) What processes are used? (2) Why are they used? (3) How are they performing?

NTIS

Asphalt; Construction; Highways; Pavements; Arizona; California; Florida; Rubber

19980011687 Maryland Univ., Center for Environmental Energy Engineering, College Park, MD USA

Experimental Evaluation of a Novel Full-Scale Evaporatively Cooled Condenser Final Report, Jan. - Dec. 1996

Hwang, Y., Maryland Univ., USA; Radermacher, R., Maryland Univ., USA; Aug. 1997; 40p; In English

Report No.(s): PB98-100506; EPA/600/R; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The report compares the performance of a novel evaporatively cooled condenser with that of a conventional air-cooled condenser for a split-system heat pump. The system was tested in an environmentally controlled test chamber that is able to simulate test conditions as specified by ASHRAE Standard 116-1983. Soft optimizations were conducted to determine optimum charge and short tube restrictor size. Design parameters of the evaporatively cooled condenser were also optimized experimentally to maximize performance. Using these optimum parameters, steady state and cyclic performance tests were conducted. The experimental results show that the evaporatively cooled condenser has a higher capacity by 1.9 to 8.1%, a compatible coefficient of performance (COP) ranging from 98.0 to 105.6%, and a higher seasonal energy efficiency ratio (SEER) by 11.5% than those of the baseline. Subtracting out the estimated appropriate parasitic power necessitated by the test setup, savings were determined to be 1.8 to 8.1% in capacity, 13.5 to 21.6% in COP, and 14.5% in SEER over the baseline.

NTIS

Heat Pumps; Evaluation; Experimentation; Air Cooling; Design Analysis; Condensers (Liquefiers)

19980012005 Army Construction Engineering Research Lab., Champaign, IL USA

Natural Gas Cooling in DOD Facilities Final Report

Sohn, Chang W., Army Construction Engineering Research Lab., USA; Brown, William T., Army Construction Engineering Research Lab., USA; Rundus, Richard E., Army Construction Engineering Research Lab., USA; Pedersen, Timothy W., Army

Construction Engineering Research Lab., USA; Durbin, Thomas E., Army Construction Engineering Research Lab., USA; Aug. 1997; 35p; In English

Report No.(s): AD-A332974; CERL-TR-97/125; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Natural gas-powered cooling systems have been introduced in the market during the last decade as an alternative to electrically driven air-conditioning systems. To accelerate the introduction of natural gas cooling technologies to DOD facilities, funding was provided for Fiscal Years 1993-95 to procure gas cooling systems for DOD installations. This study reviewed the status of the natural gas cooling demonstration programs for DOD facilities to document the progress of the Congressional natural gas cooling projects in various stages of execution. Natural gas cooling systems are currently in operation at 11 DOD installations, under construction at 23 installations, and in design at 8 installations. Preliminary reports from the DOD users in the field show that natural gas cooling systems have a strong potential for use in DOD facilities, even though a number of installations have reported problems in the early stages of system operation. Development of standard design guides and commissioning procedures will help DOD engineers eliminate such problems.

DTIC

Air Conditioning Equipment; Cooling Systems; Natural Gas

32

COMMUNICATIONS AND RADAR

Includes radar; land and global communications; communications theory; and optical communications. For related information see also 04 Aircraft Communications and Navigation and 17 Space Communications, Spacecraft Communications, Command and Tracking. For search and rescue see 03 Air Transportation and Safety, and 16 Space Transportation.

19980009091 Boeing Co., Seattle, WA USA

A 3D Electromagnetics Scattering Code on the iPSC/2 and iPSC/860

Yip, Elizabeth, Boeing Co., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 141-155; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

In this paper we present our implementation of a 3D electromagnetics scattering code on the iPSC/2 and iPSC/860. Such codes are characterized by large dense matrices and right-hand-sides. We have an in-core version and an out-of-core version of the code. We shall discuss the special features and our experiences of both versions. To speed up the matrix generation, we reorder the input geometry with the Reverse Cuthill-McKee ordering. The in-core version computes the explicit inverse of the coefficient matrix rather than its LU factorization. The out-of-core version uses the DES (Dense Equation Solver) from the Intel Supercomputer Systems Division. Another attractive feature of our code is that we can solve one large canonical problem on the iPSC/860 and use a variant of the Sherman-Morrison-Woodbury updating algorithm to do parametric studies on perturbed problems on smaller computers.

Author

Electromagnetism; Factorization; Scattering; Supercomputers

19980009223 NERAC, Inc., Tolland, CT USA

Data Compression. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-864905; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of data compression techniques in a variety of applications. Topics include coding techniques and algorithm descriptions, clustering strategies, and the efficacy of a variety of methods employed in the communication fields. Applications include image and speech compression, facsimile systems, and satellite communication. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Data Compression; Bibliographies

19980009227 NERAC, Inc., Tolland, CT USA

HDLC: High Level Data Link Control. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866926; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the computer communication protocol, HDLC, developed in the early 1970s, and adapted for use in packet switching, satellite communications, cable television, and numerical control. HDLC has been adopted as an international standard. The citations cover hardware and software modifications, improvements, and performance evaluations for the various applications.

NTIS

Bibliographies; Data Transmission; Interprocessor Communication

19980009228 NERAC, Inc., Tolland, CT USA

Voice and Data Telecommunication Systems: T1 Transmission Technology . (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866637; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning hardware descriptions and the implementation of high speed digital networks or T1 technology in telecommunications. Topics include standards development, the evolution and expansion of the technology, and networking aspects. T1 multiplexing and market aspects are also considered.

NTIS

Bibliographies; Telecommunication; Data Transmission; Data Links; Technology Transfer; Standards

19980009229 NERAC, Inc., Tolland, CT USA

Self-Pumped Phase Conjugation. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866520; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development and evaluation of Self-Pumped Phase Conjugation (SPPC) technology. Citations discuss SPPC mirrors, barium compound phase conjugators, self-pumping processes, multiwave mixing, and stimulated scattering. Applications in optical communication and information processing, surface topography, light interferometry, image recognition, laser tuning, and acoustic-optical devices are examined.

NTIS

Bibliographies; Product Development; Evaluation; Phase Conjugation

19980009235 NERAC, Inc., Tolland, CT USA

Satellite Television. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866066; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning new developments in satellite television. Recent advances in satellite broadcast of TV signals in Europe and the USA are included. New methods for digital data transmission, and technologies for encrypting and decoding TV signals are among the topics discussed. The development of High Definition TeleVision (HDTV) and other broadcast formats such as Multiplexed Analog Component (MAC) are also examined.

NTIS

Bibliographies; Broadcasting; Television Transmission; Data Transmission; Decoding; Digital Data; Satellite Communication

19980009248 NERAC, Inc., Tolland, CT USA

Strip Transmission Lines (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868948; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning technology and applications of strip and microstrip transmission lines. Applications include amplifiers, antennas, integrated circuits, and couplers. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Microstrip Transmission Lines; Strip Transmission Lines; Microelectronics

19980009274 Duke Univ., Dept. of Computer Science, Durham, NC USA

Design and Analysis of Lossless and Lossy Data Compression Methods and Applications to Communication and Caching
Final Report, 1 May 1994 - 31 Dec. 1996

Vitter, Jeffrey S., Duke Univ., USA; Apr. 1997; 9p; In English

Contract(s)/Grant(s): F49620-94-I-0217

Report No.(s): AD-A329667; AFOSR-TR-97-0364; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The work completed in the project dealt with the following areas of data compression and its applications: the design and analysis of sophisticated methods for prediction based on data compression techniques, with applications to prefetching, caching, and locality management. Fast, practical, and code-efficient implementations of arithmetic coding and other coding methods, for use in text and image compression. New methods for choosing motion vectors yielding substantially better rate-distortion trade-offs for video compression in video-conferencing applications. Duke University recently filed a patent application for the work on prediction.

DTIC

Data Compression; Coding

19980009509 Ecole Polytechnique Federale de Lausanne, Centre de Recherche en Physique des Plasma, Switzerland

Study of the parasitic oscillations in a gyrotron *Etudes des oscillations parasites dans un gyrotron*

Pedrozzi, M., Ecole Polytechnique Federale de Lausanne, Switzerland; Jan. 1997; 168p; In French

Report No.(s): LRP-566/97; DE97-619711; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This work is dedicated to the study of parasitic instabilities in a gyrotron, and to the influence of such instabilities on the interaction efficiency. The gyrotron is a high-power millimeter wave radiation source, based on the resonant interaction between a weakly relativistic electron beam immersed in a guiding magnetic field, and an electromagnetic wave. The gyrotron investigated here operates at a frequency close to 100 GHz: its main feature is that it is quasi optical. In this configuration, the electron beam interacts with a high order TEM eigenmode of a Fabry-Perot resonator, the axis of which is perpendicular to the electron beam path. During the development of this source, the highest efficiency that was achieved is approximately 30% lower than the theoretical predictions. At the same time, parasitic oscillations at frequencies close to the maximum relativistic cyclotronic frequency are detected. The power associated with these oscillations ranges from a few watts to a few kilowatts, with threshold currents of the order of 100 mA. It is suspected that the excitation of parasitic oscillations in the beam duct section before the interaction region might have a dramatic effect on the electron beam distribution function inducing, in particular, an energy spread. The cyclotron maser instability responsible for the energy exchange between particles and fields in a gyrotron, is very sensitive to energy spreads. It is thus necessary to identify the origin of the parasitic radiation. A few physical mechanisms suspected to lead to a degradation of the electron beam properties were investigated: the cyclotron maser process itself, the Bernstein electrostatic instability and the Langmuir instability. The experimental work concentrated on the study of the beam ducts between the electron gun and the resonant cavity.

DOE

Microwave Amplifiers; Electromagnetic Radiation; Relativistic Electron Beams; Interactions

19980009521 Rochester Univ., Dept. of Computer Science, NY USA

Knowledge Representation in the TRAINS-93 Conversation System

Traum, David R., Rochester Univ., USA; Schubert, Lenhart K., Rochester Univ., USA; Poesio, Massimo, Rochester Univ., USA; Martin, Nathaniel G., Rochester Univ., USA; Light, Marc, Rochester Univ., USA; Aug. 1996; 55p; In English

Contract(s)/Grant(s): N00014-92-J-1512

Report No.(s): AD-A329872; TRAINS-TN-96-4; TR-633; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

We describe the goals, architecture, and functioning of the TRAIN 5-93 system, with emphasis on the representational issues involved in putting together a complex language processing and reasoning agent. The system is intended as an experimental prototype of an intelligent, conversationally proficient planning advisor in a dynamic domain of cargo trains and factories. For this team effort, our strategy at the outset was to let the designers of the various language processing, discourse processing, plan reasoning, execution and monitoring modules choose whatever representations seemed best suited for their tasks, but with the constraint that all should strive for principled, general approaches. Disparities between modules were bridged by careful design of the interfaces, based on regular in-depth discussion of issues encountered by the participants. Because of the goal of generality and principled representation, the multiple representations ended up with a good deal in common (for instance, the use of explicit event variables and the ability to refer to complex abstract objects such as plans); and future unifications seem quite possible. We explain some of the goals and particulars of the KRs used, evaluate the extent to which they served their purposes, and point out some of the

tensions between representations that needed to be resolved. On the whole, we found that using very expressive representations minimized the tensions, since it is easier to extract what one needs from an elaborate representation retaining all semantic nuances, than to make up for lost information.

DTIC

Knowledge Representation; Extraction; Conversation

19980009548 State Univ. of New York, Dept. of Computer Science, Binghamton, NY USA

A Multiprocessor Prototype for Advanced Signal Processing

Ghose, Kanad; Oct. 1997; 32p; In English

Contract(s)/Grant(s): F30602-93-C-0229; AF Proj. 3481

Report No.(s): AD-A332096; RL-TR-97-108; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The main goal of this project was to construct a prototype DSP multiprocessing system based on the Texas Instrument TMS320C40 multiprocessing-capable CPUs and show that it provided adequate performance on the Rome Laboratory (RL) Speaker Identification (#Spkrid") code and the Speech Enhancement (#SEU") code. The original proposal called for a 8-CPU prototype and the funded project was for constructing a 4-CPU prototype. The prototype system that was constructed showed that the computational aspects of the Spkrid code and the SEU code can be easily met on the 4-CPU prototype. (At least one additional CPU, not available in the current prototype, is needed for interfacing to the A/D, D/A components.) The bulk of the proposed effort was involved with the parallelization and porting of the supplied code to the target system, and instrumenting the system to get performance measures that will indicate how the system will perform in real-time.

DTIC

Data Processing; Multiprocessing (Computers); Signal Processing; Real Time Operation

19980009549 Oklahoma State Univ., School of Electrical and Computer Engineering, Stillwater, OK USA

Numerical Investigation of Radar Scattering from the Sea Surface at Small Grazing Angles Annual Report, 1 Oct. 1996 - 30 Sep. 1997

West, James C., Oklahoma State Univ., USA; Nov. 07, 1997; 5p; In English

Contract(s)/Grant(s): N00014-96-I-0075

Report No.(s): AD-A332391; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The electromagnetic scattering from the sea surface at small grazing incidence is being examined numerically. Two numerical approaches, both extensions of the standard moment method (MM), are being used. The first is a hybrid approach that extends MM using the geometrical theory of diffraction. It has been used to examine the multipath scattering from a breaking ocean wave that may lead to sea-spike events and the effects of surface self-shadowing on distributed-surface scattering. The second approach is a periodic-surface implementation of the moment method. It has been used to examine the ability of the effects of finite surface conductivity on the scattering from wind roughened water surfaces.

DTIC

Radar Scattering; Ocean Surface; Electromagnetic Scattering; Numerical Analysis

19980009623 Brookhaven National Lab., Upton, NY USA

Fast polynomial approach to calculating wake fields

Goldstein, C. I., Brookhaven National Lab., USA; Peierls, R. F., Brookhaven National Lab., USA; Jun. 15, 1997; 12p; In English

Contract(s)/Grant(s): DE-AC02-76CH-00016

Report No.(s): BNL-64510; DE97-008746; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

In the computation of transverse wake field effects in accelerators, it is necessary to compute expressions of the form given in equations (1). It is usually desired to compute this a large number of times, the values of $z(\text{sub } i)$ and $x(\text{sub } i)$ being different at each iteration, other quantities remaining the same. The problem in practical applications is that the computational work grows as $N(\text{sub } m)(\text{sup } 2)$. Thus even using parallel computation to achieve speedup, the elapsed time to obtain a result still increases linearly with $N(\text{sub } m)$. The authors introduce here an approximate method of evaluating the sum in (1) whose computational work increases only as $N(\text{sub } m)\log N(\text{sub } m)$. It involves some significant initial computation which does not have to be repeated at each subsequent iteration. The basis of the approach is to replace the individual contributions of a group of distant macroparticles with a local series expansion. In this respect it is similar in spirit to the so called fast multipole method.

DOE

Multipoles; Polynomials; Series Expansion; Wakes

19980009756 Rochester Inst. of Tech., NY USA

A Comparative Study of Acousto-Optic Time-Integrating Correlators for Adaptive Jamming Cancellation *Final Report, Aug. 1995 - Oct. 1996*

Li, Guifang, Rochester Inst. of Tech., USA; Oct. 1997; 32p; In English

Contract(s)/Grant(s): F30602-95-C-0151; AF Proj. 4600

Report No.(s): AD-A332094; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This final report presents a comparative study of the space-integrating and time-integrating configurations of an acousto-optic correlator. Correlation of wide bandwidth time-domain signals is an important consideration for adaptive jamming cancellation. The primary objective of this effort was to systematically evaluate all existing acousto-optic correlator architectures and to determine which would be most suitable for adaptive jamming cancellation applications. An experimental investigation into the effects of vibration on the dual-path time-integrating correlator was also conducted. Results show that at low signal frequencies (i.e. 1 MHz) the correlation function fluctuates in an unpredictable manner; however, at high signal frequencies (i.e. 5 MHz) the effect of vibration is negligible.

DTIC

Acousto-Optics; Time Functions; Jamming; Correlation

19980009840 Texas A&M Univ., Dept. of Electrical Engineering, College Station, TX USA

Millimeter-Wave Active Antennas and Spatial Power Combiners *Final Report, 1 Aug. 1996 - 31 Jul. 1997*

Chang, Kai, Texas A&M Univ., USA; Oct. 15, 1997; 17p; In English

Contract(s)/Grant(s): DAAH04-96-I-0372

Report No.(s): AD-A332535; ARO-34068.6-EL; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the research activities carried out in the Electromagnetics and Microwave Laboratory, Department of Electrical Engineering, Texas A & M University. The project was sponsored by the U.S. Army Research Office under contract No. DAAH04-96-I-0372. The topics of investigation included mode stability in spatial power combining, active antenna transceivers and system applications, self-mixing active antennas, and novel uniplanar components. This final report for the period from August 1, 1996 through July 31, 1997 lists all the publications, which describe the supported research, along with the names of students who received the M.S. and Ph. D, degrees and contributed to the research.

DTIC

Millimeter Waves; Microwave Antennas; Transmitter Receivers

19980009860 NERAC, Inc., Tolland, CT USA

Demand Assignment Multiple Access Satellite Communications: Latest Citations from the INSPEC Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862966; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning a technique for the allocation of satellite communication resources called demand assignment multiple access (DAMA). The citations focus on the design and implementation of DAMA protocols including analytical models and optimization algorithms for channel assignment controllers. The use of DAMA for various mobile communications systems is also discussed.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Demand Assignment Multiple Access; Bibliographies; Satellite Communication

19980009885 NERAC, Inc., Tolland, CT USA

DECNET: Digital Equipment Corporation Network Architecture. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866611; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the network architecture DECNET provided by the Digital Equipment Corporation. Topics include hardware and software for implementing communications between different computer operating systems. DECNET's ability to create resource sharing, communications networks, and distributed computing is examined by employing specialized protocol layers which serve the functions of network control, data access control, interprogram communications, and automatic error detection and retransmission. Applications for medical information systems, chemical laboratories, electronic

mail systems, and industrial process control are presented. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Computer Networks; Architecture (Computers); Communication Networks

19980009901 NERAC, Inc., Tolland, CT USA

Digital Video Signal Recording, Processing, and Reproducing. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865159; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning methods and apparatus for digitally recording, processing, and reproducing video signals. Citations discuss recording/reproducing systems, error detection and correction, coding and decoding, multiplexing, analog-to-digital conversion, signal generation, recording media, video/audio systems, and signal enhancement.

NTIS

Analog to Digital Converters; Auditory Signals; Augmentation; Digital Television; Errors; Multiplexing; Patents; Signal Processing

19980009943 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands

Modified Lanczos Algorithm for the Computation of Transient Electromagnetic Wavefields

Remis, R. F., Technische Univ., Netherlands; van den Berg, P. M., Technische Univ., Netherlands; Oct. 1996; 38p; In English
Report No.(s): PB97-204655; Et/EM-1996-27; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new method for computing transient electromagnetic wavefields in inhomogeneous and lossy media is presented. The method utilizes a modified Lanczos scheme from which a so-called reduced model is constructed. A discretization of the time variable is then superfluous. This reduced model represents the transient electromagnetic wavefield on a certain bounded interval in time. Some theoretical aspects of the method are highlighted and numerical results showing the performance of the method for two-dimensional configurations are given. Also, comparisons between this Lanczos method and the Finite-Difference Time-domain method are made.

NTIS

Lossy Media; Electromagnetic Fields; Two Dimensional Models; Finite Difference Theory

19980009945 Vermont Univ., Dept. of Computer Science and Electrical Engineering, Burlington, VT USA

The Asymptotic Theory of the Reflection and Transmission of a Pulsed Electromagnetic Beam Field at a Planar Interface Separating Two Dispersive Media Final Report, 1 Sep. 1994 - 31 Aug. 1997

Oughstun, Kurt E., Vermont Univ., USA; Sep. 1997; 3p; In English

Contract(s)/Grant(s): F49620-94-I-0430

Report No.(s): AD-A332249; AFOSR-97-0645TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Our long-term research goal is to develop a rigorous analytic formulation and, uniform asymptotic description of pulsed electromagnetic beam-field propagation, reflection, and transmission phenomena in causally dispersive dielectric and conducting media. Emphasis has been placed first on a formulation that has been rigorously obtained from the macroscopic Maxwell's equations with constitutive relations that are appropriate for a homogeneous, isotropic, nonhysteretic, locally linear, temporally dispersive medium, followed by the development and application of the required uniform asymptotic expansion techniques that are necessary to provide a completely continuous description of the space-time evolution of the pulsed beam-field at sufficiently large propagation distances into the dispersive, attenuative medium.

DTIC

Electromagnetic Fields; Asymptotic Series; Mathematical Models; Beams (Radiation)

19980010009 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands

Image Reconstruction from Ipswich Data, Part 2

van den Berg, P. M., Technische Univ., Netherlands; Kooij, B. J., Technische Univ., Netherlands; Kleinman, R. E., Delaware Univ., USA; Nov. 1996; 17p; In English

Contract(s)/Grant(s): F49620-96-1-0039

Report No.(s): PB97-204630; Et/EM-1996-28; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this paper, we describe the results obtained by using variants of the modified gradient method developed earlier together with the new Ipswich datasets to reconstruct the shape, location, and/or index of refraction of unknown two-dimensional scatterers (infinite cylinders in three dimensions).

NTIS

Image Reconstruction; Electromagnetic Scattering; Permittivity

19980010033 Texas A&M Univ., Dept. of Electrical Engineering, College Station, TX USA

Millimeter-Wave Active Antennas and Spatial Power Combiners Final Report

Chang, Kai, Texas A&M Univ., USA; Oct. 15, 1997; 19p; In English

Contract(s)/Grant(s): DAAH04-96-I-0372

Report No.(s): AD-A332039; ARO-34068.6-EL; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the research activities carried out in the Electromagnetics and Microwave Laboratory, Department of Electrical Engineering, Texas A&M University. The project was sponsored by the U.S. Army Research Office under contract No. DAAH04-96-I-0372. The topics of investigation included mode stability in spatial power combining, active antenna transceivers and system applications, self-mixing active antennas, and novel uniplanar components. This final report for the period from August 1, 1996 through July 31, 1997 lists all the publications, which describe the supported research, along with the names of students who received the M.S. and Ph.D. degrees and contributed to the research.

DTIC

Antenna Design; Millimeter Waves

19980010100 Colorado Univ., Dept. of Applied Mathematics, Boulder, CO USA

Nonlinear Wave Propagation Final Report, 1 Jan. 1994 - 31 Dec. 1996

Albowitz, Mark J., Colorado Univ., USA; Dec. 31, 1996; 17p; In English

Contract(s)/Grant(s): F49620-94-I-0120

Report No.(s): AD-A332207; Rept-1534615; AFOSR-97-0647TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research has produced a number of fundamental contributions in: (1) nonlinear fiber optics, specifically wave length division multiplexing, (2) new classes of solutions to multidimensional nonlinear wave equations of physical significance, (3) direct and inverse scattering, (4) the propagation of magnetic spin waves in thin ferromagnetic films, and (5) computational and effective chaos associated with a class of integrable nonlinear wave equations. A summary of this effort is contained in this report, as well as a list of all publications and invited lectures.

DTIC

Nonlinear Optics; Wave Equations; Wave Propagation; Nonlinearity; Fiber Optics; Electromagnetism

19980010180 NERAC, Inc., Tolland, CT USA

Direct Broadcasting by Satellite (DBS) Antennas: Latest Citations from the INSPEC Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863063; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning design and application of direct broadcasting by satellite (DBS) antennas. Topics include frequency allocation, interference, transmission planning, performance, and fabrication cost. Microstrip, microwave, receiving, broadcasting, planar array and satellite antennas are reviewed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Broadcasting; Satellite Antennas

19980010260 NASA Langley Research Center, Hampton, VA USA

Culture and Workplace Communications: A Comparison of the Technical Communications Practices of Japanese and U.S. Aerospace Engineers and Scientists

Pinelli, Thomas E., Editor, NASA Langley Research Center, USA; Sato, Yuko, Editor, Pittsburgh Univ., USA; Barclay, Rebecca O., Editor, Knowledge Management Associates, USA; Kennedy, John M., Editor, Indiana Univ., USA; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 1-21; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The advent of global markets elevates the role and importance of culture as a mitigating factor in the diffusion of knowledge and technology and in product and process innovation. This is especially true in the large commercial aircraft (LCA) sector where the production and market aspects are becoming increasingly international. As firms expand beyond their national borders, using such methods as risk-sharing partnerships, joint ventures, outsourcing, and alliances, they have to contend with national and corporate cultures. Our focus is on Japan, a program participant in the production of the Boeing Company's 777. The aspects of Japanese culture and workplace communications will be examined: (1) the influence of Japanese culture on the diffusion of knowledge and technology in aerospace at the national and international levels; (2) those cultural determinants-the propensity to work together, a willingness to subsume individual interests to a greater good, and an emphasis on consensual decision making-that have a direct bearing on the ability of Japanese firms to form alliances and compete in international markets; (3) and those cultural determinants thought to influence the information-seeking behaviors and workplace communication practices of Japanese aerospace engineers and scientists. In this article, we report selective results from a survey of Japanese and U.S. aerospace engineers and scientists that focused on workplace communications. Data are presented for the following topics: importance of and time spent communicating information, collaborative writing, need for an undergraduate course in technical communication, use of libraries, use and importance of electronic (computer) networks, and the use and importance of foreign and domestically produced technical reports.

Author

Market Research; Commercial Aircraft; Organizations; Communicating; Decision Making; Risk; Culture (Social Sciences)

19980010335 California Univ., Berkeley, CA USA

High-Frequency Integrated Circuits for Communication Systems Final Report, 1 May 1996 - 31 Jul. 1997

Meyer, Robert G., California Univ., USA; Boser, Bernhard, California Univ., USA; Oct. 16, 1997; 7p; In English

Contract(s)/Grant(s): DAAH04-93-G-0200

Report No.(s): AD-A332551; ARO-30862.12-EL; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This research was directed towards realization of Si monolithic microwave communication transceivers. New theoretical methods were developed for the analysis of noise and distortion phenomena in nonlinear communication circuits such as Low-Noise Amplifiers (LNAs) in the over-driven condition, mixers, oscillators and detectors. Using these techniques new circuit topologies were synthesized for the realization of various essential transceiver functions, and prototype circuits were built in state-of-the-art Si monolithic processes and experimentally evaluated. New CAD approaches to the problem of mixer noise analysis were created which allow combination of large-signal time-varying circuit elements plus time-varying noise sources to be analyzed. Using this tool a new mixer topology in Si BiCMOS technology was synthesized with extremely wide dynamic range. The use of on-chip monolithic inductors allowed incorporation of a new tuned local-oscillator (LO) buffer circuit which added important degrees of freedom to the mixer realization.

DTIC

Integrated Circuits; Telecommunication; High Frequencies

19980010438 NERAC, Inc., Tolland, CT USA

Frequency Shift Keying: Mobile Radio Systems. (Latest Citations from the INSPEC Database)

Feb. 1996; In English

Report No.(s): PB96-863386; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning frequency shift keying (FSK) systems for use in mobile radio communications. References examine design, performance, improvements, and testing methods. The use of FSK design and development for digital mobile radio systems is evaluated. Error rate performance and reduction, interference environments, and noise sources of FSK systems are discussed.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Frequency Shift Keying; Radio Communication

19980010454 Rome Lab., Griffiss AFB, NY USA

Theories and Approaches to Electromagnetic Transmission in Non-Isotropic Materials

Cryer, Dawn, Rome Lab., USA; Aug. 1997; 44p; In English

Contract(s)/Grant(s): AF Proj. 2338

Report No.(s): AD-A329950; RL-TR-97-52; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Advanced composite materials are used extensively for commercial and military aircraft applications. This paper reviews numerous approaches and theories used for evaluating electromagnetic transmission through a variety of composite materials

classes. The types of composite materials discussed are: (1) graphite/epoxy composites; (2) chiral composites; (3) omega particulate composites; (4) quasioptic composites; and 50 dielectric composites. Due to the availability of open literature references, the primary focus is constrained of the first two classes (graphite/epoxy and chiral composites). Topics discussed include AC circuit simulation programs, phase-correction modeling, and wave propagation theory.

DTIC

Composite Materials; Graphite-Epoxy Composites; Electromagnetic Wave Transmission

19980010555 NERAC, Inc., Tolland, CT USA

International Telecommunication Systems, Services, and Networks Recommendations. (Latest Citations from the NTIS Bibliographic Database)

Feb. 1996; In English

Report No.(s): PB96-862412; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning recommendations from the International Telecommunication Union of Geneva, Switzerland. Specific recommendations are summarized by the International Telegraph and Telephone Consultative Committee. Topics include telephone networks and ISDN, quality of service, network management, and traffic engineering. Each recommendation reference is indexed by number for ease in ordering full text documents. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Telecommunication

19980010561 NERAC, Inc., Tolland, CT USA

Digital Signal Processors: Computational Architecture and Applications (Latest Citations from the INSPEC Database)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863626; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, development, and architecture of digital signal processors (DSPs) for use in computational applications in telecommunications, medicine, sciences, engineering, and the military. Topics include parallel architecture and algorithms, personal computers with DSPs, high-speed calculations, digital systems control, echo suppression, radar and sonar systems, neural computations, and robotic control. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Signal Processing; Digital Systems; Central Processing Units

19980010565 NERAC, Inc., Tolland, CT USA

Graphical Interface. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English

Report No.(s): PB96-864889; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design, development, and operation of graphical interface and user interface. Citations describe databases, editing and display systems, compilers, programs and files storage, object-oriented and multimedia interfaces, and interface software. Applications in data processing systems, telecommunication services, telephone switching systems, documentation, drug management, tissue assay, and robotic control are covered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Computer Graphics

19980010608 Wright State Univ., Dept. of Electrical Engineering, Dayton, OH USA

Algorithms for Digital Micro-Wave Receivers and Optimal System Identification Final Report, 1 Nov. 1993 - 31 Oct. 1996

Shaw, Arnab, Wright State Univ., USA; Jan. 23, 1997; 167p; In English

Contract(s)/Grant(s): F49620-94-I-0033

Report No.(s): AD-A332411; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

According to the original Project Proposal, the two primary directions considered in this research effort are; (1) Advanced signal processing algorithms for digital microwave receivers with Electronic Warfare applications: Significant contribution has

been made on estimating the Angles-Of-Arrival (AOA) or frequencies. Specifically, a computationally efficient and accurate Minimum-Norm Method has been developed that does not require any analysis. Theoretical Perturbation Analysis of this method has been completed. A Maximum-Likelihood Estimator that ensures unit circle frequencies has been developed. Furthermore, a new pipelined adaptive algorithm for Tracking moving targets has been presented. (2) Optimal identification of rational transfer functions: unlike existing algorithms which either modify or linearize the error criterion, the true criteria have been decoupled into (1) a purely linear problem for numerator and (2) a nonlinear problem with reduced dimensionality for the denominator. the decoupled estimators possess global optimality properties both have reduced computational complexity than existing methods. The results on 1-D cases have been extended for multi-Dimensional systems. In addition, a new 'Distributed Look-Ahead' architecture and an Optimal Approximation Approach have been proposed for high-speed implementation of Recursive Filters.

DTIC

Circles (Geometry); Electronic Warfare; Maximum Likelihood Estimates; Microwave Equipment; Nonlinearity; Optimization; Perturbation; Pipelines; Radio Receivers

19980010839 Carnegie-Mellon Univ., Dept. of Mathematics, Pittsburgh, PA USA

Computational Methods for Electromagnetic Scattering and Structural Phase Transitions, 1 Jun. 1994 - 31 Jul. 1997

Nicolaides, Roy A., Carnegie-Mellon Univ., USA; Aug. 1997; 5p; In English

Contract(s)/Grant(s): F49620-94-0311

Report No.(s): AD-A332005; AFOSR-97-0634TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Computational algorithms for electromagnetic scattering and structured phase transitions are investigated. For scattering, three contributions are presented: (1) Analysis of spurious offset fields; (2) the use of divergence boundary conditions; and (3) analysis of covolume (unstructure FDTD) algorithms with estimates of convergence rates. For structural phase transitions adaptive mesh techniques are combined with finite dimensional optimization algorithms to compute new global minimizers for martensitic phase transformations.

DTIC

Electromagnetic Scattering; Numerical Analysis; Computation; Martensitic Transformation

19980010840 Brown Univ., Providence, RI USA

New Models and Fast Algorithms for Natural and Urban Clutter with Applications Final Report, Aug. 1995 - Jan. 1997

Cooper, David B., Brown Univ., USA; Jul. 1997; 33p; In English

Contract(s)/Grant(s): F49620-95-I-0499

Report No.(s): AD-A332033; AFOSR-97-0680TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To address the Automatic Target Detection/Recognition (ATD/R) community's long term goal of 'revolutionizing wide-area imagery analysis', the research presented in this report focused on two enabling technologies: (1) clutter models based on Synthetic Aperture Radar (SAR) in urban environments; and (2) fast algorithms for Markov Random Fields. The former investigated the nature of building signatures in SAR imagery, and saw the development of a building detector. Buildings contribute a large number of false target detections, and targets stationed in close proximity to buildings can be missed using conventional analysis methods. The latter effort revisited signal processing to make theoretical headway in developing reduced computational cost techniques for estimating and using stochastic target and clutter models based on Markov Random Fields. These algorithms have broad application to a large variety of ATD/R concerns.

DTIC

Image Processing; Markov Processes; Models; Algorithms; Technologies

19980010847 Naval Postgraduate School, Monterey, CA USA

Electronic Counter-Counter Measures Potential of a Noncoherent FH/MFSK Communications System Under Conditions of Worst Case Hostile Electronic Counter Measures and Fading Channels

Katsoulis, George T., Naval Postgraduate School, USA; Mar. 1997; 96p; In English

Report No.(s): AD-A331974; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis investigates the performance degradation resulting from multitone interference of orthogonal, noncoherent, frequency-hopped, M-ary frequency-shift keyed receivers (FH/MFSK) where the effect of thermal and other wideband noise is not neglected. The multiple, equal power jamming tones are assumed to correspond to some or all of the possible FH M-ary orthogonal signaling tones. Furthermore, the channel is modeled as a Ricean fading channel, a possibility precluded when thermal noise is neglected. Both the signaling tones and the multiple interference tones are assumed to be affected by channel fading. Both band and independent band multitone interference are considered. Performance is evaluated by obtaining a union bound on the probability of bit error, and receiver performance is compared with exact results for band multitone interference of a noncoherent FH/

MFSK receiver under comparable circumstances. Except for the case of Rayleigh fading of the signal, the union bound is very tight for those cases that can be compared with exact results. The advantages of the union bound approach are twofold. First, the union bound approach yields a solution that is far less computationally intensive than that obtained with the exact approach. Second, the union bound approach allows numerical results to be obtained for interference conditions that are not amenable to exact analysis, such as independent multitone interference of FH/MFSK.

DTIC

Electron Counters; Performance Tests; Degradation; Telecommunication

19980010861 Naval Postgraduate School, Monterey, CA USA

Expected Performance of the Global Broadcast Service (GBS), Phase II, with Emphasis on Environmental Limitations to Supportable Data Rates

Scotty, Stephen D., Naval Postgraduate School, USA; Jun. 1997; 101p; In English

Report No.(s): AD-A331511; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The US military requires a high capacity, high availability broadcast capability to provide timely dissemination of standard products to users who cannot rely on terrestrial links. The Global Broadcast Service (GBS) is being developed to meet this requirement. The key limiting factor in GBS availability is environmental losses, specifically atmospheric absorption and rainfall loss. The optimum frequency band for GBS would have been between 1-10 GHz. At this frequency range, environmental losses are negligible. However, congestion in this frequency range has forced DoD to choose a much higher frequency band for GBS, 20/30 GHz (K/Ka band). At this frequency band environmental losses, specifically rain loss, will be a key limiting factor to GBS availability. This thesis analyzes GBS Phase 2 performance taking into account atmospheric limitations. A key problem in determining the performance of GBS lies in the accuracy of existing rain loss models. Several rain loss prediction models were considered, and based on studies conducted by the ITU-R and Stanford Telecom, the USA rain model was chosen for this analysis. This thesis has shown that, due to environmental losses, high availability can best be achieved if GBS is capable of lowering its data rate during periods of precipitation.

DTIC

Atmospheric Attenuation; Congestion; Extremely High Frequencies; Frequencies; Frequency Ranges; Mathematical Models

19980010890 Ohio Univ., Athens, OH USA

L1: Band Receiver: Implementation and Performance Analysis Final Report, 1 Jul. 1995 - 30 Jun. 1996

Braasch, Michael S., Ohio Univ., USA; Aug. 30, 1996; 5p; In English

Contract(s)/Grant(s): F49620-96-I-0368

Report No.(s): AD-A332034; AFOSR-97-0674TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Report describes work performed by Ohio University in the research of a software radio architecture applied to satellite-based navigation receivers.

DTIC

Software Engineering; Radio Receivers; Performance Prediction

19980010948 Naval Postgraduate School, Monterey, CA USA

Optimum Codes for FFH/BFSK Receivers with Self-Normalization Combining and Hard Decision Decoding in Fading Channels

Xenofon, Nikolakopoulos, Naval Postgraduate School, USA; Mar. 1997; 80p; In English

Report No.(s): AD-A331918; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The application of forward error correction coding to a fast frequency-hopped binary frequency-shift keying (FFH/BFSK) noncoherent receiver with self-normalization combining under broadband and partial-band jamming is discussed in this thesis. The performance of the receiver is examined when data are encoded using Reed-Solomon codes, convolutional codes, and concatenated Reed-Solomon and convolutional codes, all with hard decision decoding. The effects of the transmission channel is considered, and results are derived for a Rayleigh fading channel and Ricean fading channels with several different ratios of direct-to-diffuse signal power. Only frequency nonselective, slowly fading channels are considered. The combination of diversity and forward error correction coding is found to improve the performance of the receiver in the presence of both broadband and partial-band jamming and optimum codes for each coding scheme are also discussed.

DTIC

Frequency Shift Keying; Reed-Solomon Codes; Frequency Hopping; Error Correcting Codes; Pulse Communication

19980010981 Naval Postgraduate School, Monterey, CA USA

Applied Computational Electromagnetics Society Journal, Volume 12

Nov. 1997; 73p; In English

Report No.(s): AD-A331521; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Partial contents include: (1) Domain Decomposition Strategies for Solving the Maxwell Equations on Distributed Parallel Architectures; (2) Moment Method Surface Patch and Wire Grid Accuracy in the Computation of Near Fields; (3) Using the FDTD Method to Model the Reflection Coefficient of a Vivaldi Tapered Slot Antenna Fed Through a Planar Balun; (4) Finite-Difference Time-Domain Modeling of Light-Trapping in Solar Cells; (5) Modeling Eddy Currents in Unbounded Structures Using the Impedance Method; and (6) Verification of Software for Electromagnetic Field Analysis Using Models Proposed by Investigation Committees in IEE of Japan.

DTIC

Electromagnetic Fields; Applications Programs (Computers); Domains; Parallel Processing (Computers); Architecture (Computers)

19980010989 George Mason Univ., Center of Excellence in Command Control Communications/Intelligence, Fairfax, VA USA

Detection and Classification of Synthetic Aperture Radar Targets Final Report, 15 Aug. 1993 - 30 Sep. 1997

Chang, K. C., George Mason Univ., USA; Sep. 30, 1997; 37p; In English

Contract(s)/Grant(s): F49620-93-I-0492

Report No.(s): AD-A332580; 5-25707-97-1; AFOSR-TR-97-0615TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This final report described the ASSERT project 'Detection and Classification of Synthetic Aperture Radar Targets' associated with the URI Automatic Target Recognition (ATR) project sponsored by DARPA. The main goal of this ASSERT project together with the URI-ATR project is to develop detection and classification algorithms for automatic target recognition. For the ASSERT project, we have focused on the use of Bayesian probabilistic reasoning approach to fuse multiple target feature data for the purpose of target classification. We also developed Bayesian network learning algorithms to automatically construct the Bayesian network model. In this project, there were two graduate students and one undergraduate students participated in the technical work. Of whom, two of them have received M.S. degrees and one of them is continuing his Ph.D. degree. This project directly or indirectly supported the publications of eight technical papers, two Master thesis, one Ph.D. thesis, and one technical report.

DTIC

Synthetic Aperture Radar; Radar Targets; Algorithms

19980010992 Mark Resources, Inc., Torrance, CA USA

Identification of Moving Ground Vehicles in SAR Imagery Final Report, 24 Oct. 1996 - 30 Nov. 1997

Rihaczek, A. W., Mark Resources, Inc., USA; Hershkowitz, S. J., Mark Resources, Inc., USA; Doung, T. V., Mark Resources, Inc., USA; Nov. 1997; 77p; In English

Contract(s)/Grant(s): N00014-96-C-0453

Report No.(s): AD-A332596; MRI-389-3; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The objective of this effort was to process and analyze SAR data on moving ground vehicles to determine how they can be identified. The SAR data were collected at China Lake and are known as the Dragnet/MTE data set. The primary conclusion from this work is that the identification procedures we previously developed for aircraft had to be extensively modified in order to be applicable to moving ground vehicles. The fundamentals are still the same, however, namely that the identification must be based on an analysis of complex imagery, amplitude and phase. The resulting analysis and processing procedures show considerable promise in the identification of moving ground vehicles.

DTIC

Radar Imagery; Synthetic Aperture Radar; Image Processing; Aerial Photography

19980011524 NERAC, Inc., Tolland, CT USA

Bistatic and Multistatic Radar: Surveillance, Countermeasures, and Radar Cross Sections. (Latest citations from the NTIS Bibliographic Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851322; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the theory and development of bistatic and multistatic radar to increase the information available from the radar electromagnetic wave scattering, or to limit detectability by use of multiple locations for

transmitter and receiver units. Applications include synthetic aperture radar, over-the-horizon radar, search and tracking radar, operations against stealth targets, and operations in a jamming or clutter environment. Many of the studies investigate radar cross sections for target classification purposes.

NTIS

Bibliographies; Multistatic Radar; Product Development; Mathematical Models; Radar Cross Sections

19980011537 NERAC, Inc., Tolland, CT USA

Mobile Telephones . (Latest citations from the INSPEC Database)

Nov. 1997; In English; Page count unavailable.

Report No.(s): PB98-850779; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning mobile telephones and systems. Digital, cellular, and radio telephones are reviewed. References also discuss telephone systems for land mobiles, personal telephone systems and services, bandpass and digital filters, mobile antennas, electromagnetic compatibility, and echo and interference suppression.

NTIS

Bibliographies; Telephones; Telecommunication; Mobile Communication Systems

19980011538 NERAC, Inc., Tolland, CT USA

Polymer Waveguides. (Latest citations from the INSPEC Database)

Nov. 1997; In English; Page count unavailable.

Report No.(s): PB98-850753; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and characterization of polymer waveguides used in optical communication systems. References discuss the use of polymer waveguides for optical interconnections in high speed communication and signal processing systems. Also discussed are packaging of optoelectronic devices and high speed optoelectronic switches for use in broadband communication networks.

NTIS

Bibliographies; Waveguides; Electromagnetic Wave Transmission; Optoelectronic Devices

19980011587 Technische Univ., Delft, Netherlands

Error Estimates for Finite Element Potential and Field Strength Formulations

Lager, I. E., Technische Univ., Netherlands; Nov. 1996; 17p; In English

Report No.(s): PB97-203202; ET/EM-1996-34; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The accuracy in the case of finite element potential-based formulations is compared with the one which is yielded by finite element formalisms that allow the direct computation of the field strength. by using general results from the theory of Sobolev spaces, the gradient and curl operators are shown to reduce the accuracy in the case of numerical formalisms with one order. In this manner, the accuracy yielded by a numerical formalism that allows the direct computation of the field strength is proven to be superior to the one which is yielded by potential-based formulations, for the same computational effort.

NTIS

Finite Element Method; Field Strength; Gradients; Operators (Mathematics); Accuracy; Potential Fields

19980011593 National Inst. of Standards and Technology, Gaithersburg, MD USA

Federal Implementation Guideline for Electronic Data Interchange. ASC X12 003050 Transaction Set 843 Response to Request for Quotation. Implementation Convention

Favreau, J. P., National Inst. of Standards and Technology, USA; 1996; 154p; In English

Report No.(s): PB96-168984; NIST/SP-881-7; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This Draft Standard for Tidal Use contains the format and establishes the data contents of the Response to Request for Quotation Transaction Set (843) for use within the context of an Electronic Data Interchange (EDI) environment. The transaction set can be used to provide potential buyers with price, delivery schedule, and other terms from potential sellers of goods and services, in response to a request for such information.

NTIS

Procurement; Computer Networks; Information Systems; Standards; Data Processing; Tides

19980011607 Army Research Lab., Aberdeen Proving Ground, MD USA

High-Altitude Electromagnetic Pulse Simulation Test on Northern Telecom Inc. FD-565 Optical Fiber Transmission System Final Report, Jul. 1990 - Jul. 1992

Nguyen, Eric, Army Research Lab., USA; Mar, Mark H., Army Research Lab., USA; Reyzer, Ronald J., Army Research Lab., USA; Aug. 1997; 67p; In English

Report No.(s): AD-A330605; ARL-TR-1466; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report describes the tests on the Northern Telecom Inc. (NTI), FD-565 Optical Fiber Digital Transmission System against the High-altitude ElectroMagnetic Pulse (HEMP). It contains the information presented in NCSTIB-91-1 and HDL SR-91-8 along with the results of the second-phase of testing at the Defense Nuclear Agency (DNA) Advanced Research Electromagnetic Simulator (ARES) facility. This report documents the FD-565 system configuration and test configurations and describes the test facilities and data acquisition and processing systems. The tests were carried out at different HEMP facilities because the 60-kV/m free-field level could not be reached at the Naval Air Test Center (NATC) facility as planned. Three different kinds of data are presented: operational data, bulk-current data, and field-level data. For the purpose of statistical analysis, all the operational data are tabulated at the end of this report.

DTIC

Electromagnetic Pulses; Evaluation; Performance Tests; Fiber Optics

19980011615 Naval Postgraduate School, Monterey, CA USA

Wireless Communications for a Multiple Robot System

Bekas, Alexander J., Naval Postgraduate School, USA; Mar. 1997; 116p; In English

Report No.(s): AD-A331876; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A multi-disciplinary research project is being undertaken at NPS to develop a semi-autonomous robotic system to detect and clear land mines and Unexploded Ordnance (UXO). The robotic system under development consists of a land vehicle, an aerial vehicle, and a ground-based control station. Reliable communication between these three stations is needed. A traditional wire-based network requires that the vehicles be tethered and severely limits the mobility of the vehicles. A wireless Local Area Network (LAN) is proposed to provide communications between the control station and the vehicles. The objective of this thesis is to develop the physical (hardware) and logical (software) architecture of a wireless LAN that accommodates the needs of the mine/UXO project. Through an analysis of wireless modulation techniques, a market survey of wireless devices, and a field testing of wireless devices, a wireless LAN is designed to meet the technological, performance, regulation, interference, and mobility requirements of the mine/UXO project. Finally, the wireless communication protocols and the development of an error-free application protocol (specified by a FSM model and implemented in ANSI C code using Windows socket network programming) completes the wireless LAN implementation.

DTIC

Wireless Communication; Robotics; Mines (Ordnance); Local Area Networks; Computer Programs

19980011641 Atlantic Coast Technologies, Inc., Silver Spring, MD USA

UNIX Speech Processing Development Final Report, Sep. 1994 - Aug. 1995

Sabrin, Howard, Atlantic Coast Technologies, Inc., USA; Oct. 1997; 65p; In English

Contract(s)/Grant(s): F30602-94-C-0280; AF Proj. 4594

Report No.(s): AD-A332983; RL-TR-97-97; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The purpose of the program was threefold: First, develop a Speech Enhancement Unit (SEU) workstation that would run ANSI Standard C versions of the SEU algorithms on a UNIX platform using a user-friendly Graphical User Interface. Second, test the algorithms and quantify their performance, finding, wherever possible, unpredicted aspects of performance. Compare the latest versions of the algorithms with earlier versions. Third, develop, in Matlab, Automatic Gain Control (AGC) algorithms to ensure dynamic range preservation and prevent clipping, at the back end to improve listening levels for the user, and as a spectral tilt compensation mechanism.

DTIC

Graphical User Interface; Preserving; Single Event Upsets; Spectra; UNIX (Operating System); Workstations

19980011645 Naval Postgraduate School, Monterey, CA USA

A Direct Sequence: Code Division Multiple Access/Binary Phase Shift Keying (DS-CDMA/BPSK) Modem Design

Kocakanat, Murat, Naval Postgraduate School, USA; Mar. 1997; 63p; In English

Report No.(s): AD-A331464; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this thesis, the design of a direct sequence - code division multiple access/binary phase-shift keying (DS-CDMA/BPSK) modem is examined. In this prototype modem design, a short maximal length sequence of 31 chips is used to spread the information data. The design can be extended to longer codes which would provide greater capacity and processing gain. The hardware used in the functional realization of a working design is also discussed, the preliminary operational characteristics of a spread spectrum BPSK modem are achieved. The multi-user performance analysis is conducted using Bit Error Rate (BER) test equipment (HP1645A). The development of the final version of the modem operating at radio frequency (RF) is not conducted, but proof of concept is provided.

DTIC

Code Division Multiple Access; Binary Phase Shift Keying; Modems

19980011648 Federal Aviation Administration, Atlantic City, NJ USA

Human Factors Evaluation of Vocoders for Air Traffic Control Environments Phase I: Field Evaluation

Ladue, James, Federal Aviation Administration, USA; Sollenberger, Randy L., Federal Aviation Administration, USA; Belanger, Bill, Federal Aviation Administration, USA; Heinze, Annemarie, Federal Aviation Administration, USA; Sep. 1997; 61p; In English

Report No.(s): AD-A331577; DOT/FAA/CT-TN97/11; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Communication congestion is a major problem facing the air traffic control system. Vocoders offer a potential solution to this problem by compressing a digitized human speech signal to achieve low bandwidth voice transmissions. Air traffic controllers and pilots must find new systems usable and acceptable before the FAA authorizes implementation. This study compared the performance of two 4.8 kbps vocoders (designated as A and B) with the current analog radio system. Two hundred and seven current air traffic controllers participated in the study. Participants listened to recorded audio messages and provided written responses. The dependent measures included both subjective ratings and objective measures of intelligibility and acceptability. The research design controlled the independent measures of sex of speaker, background noise, and communication equipment. The results indicated that analog radio and vocoder B communications scored subjectively similar. Participants rated radio higher than vocoder B in intelligibility and vocoder B higher than radio in acceptability. They gave Vocoder A the lowest ratings using the subjective scales. An objective message completion test revealed that vocoder B was more intelligible than vocoder A. The results found no generally preferred sex of speaker for vocoder transmissions. There were no major effects of cockpit background noise on the communications.

DTIC

Communication Equipment; Human Factors Engineering; Evaluation; Air Traffic Control

19980011652 Naval Postgraduate School, Monterey, CA USA

A Direct-Sequence-Code Division Multiple Access/Differential Phase-Shift Keying (DS-CDMA/DPSK) Modem Design

Kara, Onder, Naval Postgraduate School, USA; Mar. 1997; 71p; In English

Report No.(s): AD-A331718; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The development of a differential phase-shift keying (DPSK), direct sequence, spread spectrum modem is conducted for the purpose of creating a prototype design to be implemented in a multi-user environment. In this design, a maximal length sequence of 31 chips is used to spread the information data. The multi-user performance analysis is performed by using Bit Error Rate (BER) test equipment (1645 Hewlett Packard data error analyzer). A multi-user interference cancellation circuit for two users is introduced, and measurements are performed to show its effectiveness. The design itself encompasses the selection of components and demonstrates that the preliminary operational characteristics of a spread spectrum DPSK modem scheme for CDMA application can be achieved.

DTIC

Code Division Multiple Access; Phase Shift Keying; Modems

19980011658 Naval Command, Control and Ocean Surveillance Center, Research, Development, Technology and Evaluation Div., San Diego, CA USA

RMON-2 Implementation and Results for the Automated Digital Networking System During JWID 97 Final Report, period ending Aug. 1997

Jacobs, E. W., Naval Command, Control and Ocean Surveillance Center, USA; Stell, M. E., Naval Command, Control and Ocean Surveillance Center, USA; Gutman, L. M., Naval Command, Control and Ocean Surveillance Center, USA; Sep. 1997; 26p; In English

Report No.(s): AD-A331752; NCCOSC-TR-1755; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Automated Integrated Communications System (AICS) is an advanced engineering program chartered to investigate the best ways of deploying commercial network management technologies in the Navy afloat networking environment and to determine the requirements and practices for adopting commercial network management to the Navy arena. For the 1997 Joint Warrior Interoperability Demonstration (JWID 97), a RMON-2 probe was installed and utilized in the ADNS lab. Besides providing data points for the measures of effectiveness, this experiment exposed engineers and managers of networking programs to the technology and gave them an opportunity to judge how well it might fit their systems. This paper reviews the operations and outcomes of that experiment.

DTIC

Communication Networks; Pulse Communication

19980011659 Naval Postgraduate School, Monterey, CA USA

Applied Reliable Multicast Using the Xpress Transport Protocol (XTP)

Johnstone, George S., Naval Postgraduate School, USA; Williams, Glenn D., Naval Postgraduate School, USA; Mar. 1997; 135p; In English

Report No.(s): AD-A331754; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Reliable multicast protocols provide a means to deliver data from one sender to many receivers with assurance. Reliable multicast is better suited than unicast for the bandwidth restricted, high error rate, hostile communications environment found in the military's tactical arena. General purpose protocols ensure adaptability to the variety of communications suites currently used by the military. As well, any acceptable multicast protocol must support varying levels of assurance, from unreliable delivery to full reliability. This thesis evaluates the performance capabilities of one implementation of the Xpress Transport Protocol SandiaXTP, which is a reliable multicast transport protocol. Four experiments are run on a testbed consisting of four Sun SPARC4 workstations. These experiments look at unicast and multicast transmissions with varying numbers of induced errors. The included performance measurements examine the various challenges present in a communications medium subject to attack. The results demonstrate that reliable multicast in a tactical environment is possible.

DTIC

Communication Networks; Data Transmission; Packet Switching; Protocol (Computers); Telecommunication

19980011670 Florida Univ., Dept. of Psychology, Gainesville, FL USA

Auditory Pattern Memory and Group Signal Detection Final Report

Sorkin, Robert D., Florida Univ., USA; Sep. 30, 1997; 72p; In English

Contract(s)/Grant(s): F49620-93-I-0281; AF Proj. 2313

Report No.(s): AD-A332882; AFOSR-97-0705TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This project examined how human listeners discriminate temporal patterns and how groups of human observers detect signals presented on complex visual displays. The experiments with temporally-coded auditory patterns showed how listeners' attention is influenced by the position and the amount of information carried by different segments of the pattern. Analyses of group signal detection included mathematical analyses, computer simulations, and human experiments. These analyses specified the effects on performance of team member ability, team decision rule, correlation between member judgments, and type of member interaction. The results of this research may be useful for improving the design of auditory display systems and for optimizing the performance of decision making teams.

DTIC

Auditory Signals; Computerized Simulation; Human Performance; Signal Detection

19980011695 Charles River Analytics, Inc., Cambridge, MA USA

Framework for Automatic Target Recognition Optimization Final Report, 6 Nov. 1996 - 31 Oct. 1997

Ruda, Harold, Charles River Analytics, Inc., USA; Snorrason, Magnus, Charles River Analytics, Inc., USA; Shue, David, Charles River Analytics, Inc., USA; Oct. 31, 1997; 81p; In English

Contract(s)/Grant(s): N68936-97-C-0002

Report No.(s): AD-A332739; R96451; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

We have designed a framework for the optimization of Automatic Target Recognition (ATR) algorithms. Successful ATR algorithms are complex, with non-linear components and feedback between components, and thus do not lend themselves to traditional analytical optimization methods. A prototype of the designed framework has been implemented with a visual programming interface that simultaneously aids design decisions and provides opportunities for improvements and optimizations. This framework is applicable to individual algorithms, groups of algorithms, and whole ATR suites. The framework can accommodate larger systems where the ATR algorithm is but one part; it is also possible to embed the framework into a larger system. We established

concept feasibility in Phase I, which specified a design and implemented a prototype for the ATR optimization framework entirely in Java. The Phase I effort included a built-in ATR taxonomy to aid algorithm design and successfully demonstrated algorithm optimization.

DTIC

Algorithms; Optimization; Target Recognition; Embedding; Nonlinearity

19980011981 Naval Undersea Warfare Center, Newport Div., Newport, RI USA

Measurement of Geomagnetic and Atmospheric Noise at a Remote Site *Final Report*

Bruno, Anthony B., Naval Undersea Warfare Center, USA; Kasper, Rolf G., Naval Undersea Warfare Center, USA; Hall, Robert C., Naval Undersea Warfare Center, USA; Sep. 10, 1997; 14p; In English

Report No.(s): AD-A332988; NUWC-NPT-TR-10818; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A magnetic field observatory has been established at Fisher's Island, NY, where the geomagnetic and atmospheric noise in the frequency band from 0.6 to 30 Hz is measured continuously. The primary sensors are an orthogonal pair of 2-m air-core loops, whose sensitivity makes them among the world's quietest at 70 ft/gamma Hz. These loops are free of mechanical interference from natural forces (such as wind and waves), having been designed so that their electrical band is below the first mechanical resonance at 37 Hz. After transmission directly over an existing microwave link to a laboratory in New London, CT, the data are plotted on a frequency-versus-time spectrograph for quick-look analysis while they are simultaneously digitized, Fourier transformed, averaged, and stored on magnetic disk. Averaged plots of magnetic field strength over various time cycles have been made. General observations show that the atmospheric noise is highest in the summer, corresponding to increased electrical activity in the tropics. Averaged Schumann resonances have also been plotted over a one year timeframe to show characteristic seasonal effects.

DTIC

Air Water Interactions; Atmospherics; Frequencies; Geomagnetism; Magnetic Disks; Magnetic Fields; Magnetic Flux; Spectrographs

19980011986 NERAC, Inc., Tolland, CT USA

Radar Antennas. (Latest citations from the US Patent Bibliographic File with Exemplary Claims)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851280; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning radar antennas and systems. The antenna design and fabrication for use in satellites, aircraft, and commercial buildings are presented. References cover synthetic aperture, Doppler, directional, phased array, random frequency, moving and rotational, and self-deployable antennas. Signal jamming and interference reduction are included.

NTIS

Bibliographies; Radar Antennas; Design Analysis; Fabrication; Antenna Design

33

ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry. For related information see also 60 Computer Operations and Hardware and 76 Solid-State Physics.

19980009150 NERAC, Inc., Tolland, CT USA

Brushless Motors. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866462; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design and applications of brushless electric motors. Citations cover speed control systems, drive devices, winding methods, power supply, noise prevention, and protection devices for brushless motors. Applications include use in portable communication systems, laser scanners, data storage, pumps and fans, recording/reproduction systems, and underwater vehicles.

NTIS

Bibliographies; Patents; Electric Motors; Design Analysis; Speed Control; Electric Power Supplies

19980009216 NERAC, Inc., Tolland, CT USA

Servomotors. (Latest Citations from the Aerospace Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): NASA/TM-96-206740; NAS 1.15:206740; PB96-865563; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, testing, and application of servomotors. AC, DC, and brushless motor drives are discussed. Applications are examined, including use in hydraulic presses; teleprinters; machine tools; sewing machines; and servocontrol devices for instrumentation, robots, and aircraft control. Testing methods evaluate precision, vibration and vibration reduction, and stability of servomotors.

NTIS

Bibliographies; Servomotors; Design Analysis; Brushes (Electrical Contacts); Performance Tests

19980009231 NERAC, Inc., Tolland, CT USA

Frequency Multipliers: Technology and Applications. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866504; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theory, design, and operational characteristics of frequency multipliers. Citations focus on mathematical models, analysis, development, and performance. Millimeter and submillimeter wavelength, MES-FET, GaAs FET, two-cavity gyrotron, digital phase-locked, Schottky-varactor, S-band, V-band, W-band, and X-band frequency multipliers are covered. Circuit applications include Type SC monostable multivibrator, power amplifier, digital radio, optical quantum generator, and Van de Graaff accelerator.

NTIS

Bibliographies; Frequency Multipliers; Design Analysis; Mathematical Models; Technology Utilization; Product Development

19980009359 NERAC, Inc., Tolland, CT USA

Epoxy Encapsulants for Electronics. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865571; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning techniques and equipment used in the encapsulation of electric and electronic components. Epoxy resin systems are discussed with reference to electrical insulating properties. Integrated circuits, electronic chips, semiconductor devices, and hybrid circuit assemblies are included.

NTIS

Bibliographies; Coatings; Technologies; Epoxy Resins; Encapsulating; Electronic Equipment

19980009501 NERAC, Inc., Tolland, CT USA

Frequency Doublers: Technology and Applications. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count available.

Report No.(s): PB96-866454; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning computer simulation, design, and operational characteristics of frequency doublers. Citations focus on circuit structure, performance, mathematical models, analysis, and design. Sinusoidal, pulse, GaAs FET MMIC, KD*P, C-band, Ka-band, L-band, S-band, and Q-to-W-band frequency doublers are covered. Circuit applications include high average power, diode lasers, blue light generation, millimeter wave, radar systems, and satellite TV reception.

NTIS

Bibliographies; Frequency Multipliers; Technologies; Design Analysis; Mathematical Models

19980009523 Northeastern Univ., Dept. of Electrical and Computer Engineering, Boston, MA USA

Linear and Reentrant Crossed-Field Amplifiers for in situ Measurements, Comparisons with Numerical Simulations and Study of Noise Mechanisms Final Report, 30 Dec. 1993 - 29 Dec. 1996

Chan, Chung, Northeastern Univ., USA; Ye, J., Northeastern Univ., USA; Dec. 1996; 28p; In English

Contract(s)/Grant(s): F49620-94-I-0096; AF Proj. A820

Report No.(s): AD-A329788; AFOSR-TR-97-0362; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have performed in situ measurements in two low frequency CFAs to study several basic physics issues which may lead to CFA noise reduction. Our measurements include the local radio-frequency (RF) fields, electron density profiles, electron energy distributions and noise spectrums in both the linear CFA and the reentrant CFA. Comprehensive electron density measurements of the interaction region as well as parametric comparisons such as gain versus sole voltage, beam current and frequency have been used to benchmark two computer simulation codes, MASK and NESSP.

DTIC

Computerized Simulation; Density Distribution; Density Measurement; Electron Density (Concentration); Electron Density Profiles; Electron Energy; Energy Distribution; Frequencies

19980009544 Northwestern Univ., Evanston, IL USA

In-Situ Studies of Metal on III-V Semiconductors Final Report, 1 May 1993 - 30 Apr. 1997

Marks, L. D., Northwestern Univ., USA; Apr. 1997; 8p; In English

Contract(s)/Grant(s): F49620-93-i-0208; AF Proj. 2303

Report No.(s): AD-A329760; AFOSR-TR-97-0451; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Research has been performed using high resolution electron microscopy under ultra-high vacuum (UHV) conditions on a number of metal semiconductor systems. The new system combining classical surface characterization techniques and growth has been installed on a UHV microscope and fully tested. The growth at the monolayer level of Au and Ag on Si (001) has been studied combining XPS and electron microscopy. Studies of the growth of Au on both air introduced and Ga-rich GaAs (001) substrates have been performed. A variety of new methodologies and techniques have been developed, most notably atomic scale imaging of surfaces at a higher level than previously possible and new methods of determining surface structures just from electron (or x-ray) diffraction data. Electron microscopy studies of MoS₂ lubricant films are also described.

DTIC

Electron Diffraction; Electron Microscopy; Gallium Arsenides; Molybdenum Disulfides; Photoelectron Spectroscopy; Semiconductors (Materials); Ultrahigh Vacuum; X Ray Diffraction; X Ray Spectroscopy

19980009545 NERAC, Inc., Tolland, CT USA

Microwave Devices. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865555; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning design, fabrication, evaluation, and applications of microwave devices, including microwave integrated circuits. Materials and methods for fabricating microwave elements used as components of microwave devices are discussed, including amplifiers, transmitters, receivers, resonators, and oscillators. Assembly and planar manufacturing techniques of microwave integrated circuits are presented. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Microwave Equipment

19980009618 NERAC, Inc., Tolland, CT USA

Dark Current: Effects and Management. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865134; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the treatment of dark current in the design of components and equipment. Citations focus on measurement methods, performance degradation, effects of material modification, theoretical analysis, and evaluation of low to ultra low dark current. Topics cover methods of reduction, improvement in characteristics, resonant tunneling, and dynamic suppression. Equipment discussed includes image sensors, charge coupled devices, quantum well devices, focal plane arrays, and optical detectors. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Dark Current; Infrared Detectors; Photometers

19980009745 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Trends in Performance and Characteristics of Ultra-Stable Oscillators for Deep Space Radio Science Experiments

Asmar, Sami, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications

of Clocks in Space; Aug. 01, 1997, pp. 195-199; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Telecommunication systems of spacecraft on deep space missions also function as instruments for Radio Science experiments. Radio scientists utilize the telecommunication links between spacecraft and Earth to examine very small changes in the phase/frequency, amplitude, and/or polarization of radio signals to investigate a host of physical phenomena in the solar system. Several missions augmented the radio communication system with an Ultra-Stable Oscillator (USO) in order to provide a highly stable reference signal for oneway downlink. This configuration is used in order to enable better investigations of the atmospheres of the planets occulting the line-of-sight to the spacecraft; one-way communication was required and the transponders' built-in auxiliary oscillators were neither sufficiently stable nor spectrally pure for the occultation experiments. Since Radio Science instrumentation is distributed between the spacecraft and the ground stations, the Deep Space Network (DSN) is also equipped to function as a world-class instrument for Radio Science research. For a detailed account of Radio Science experiments, methodology, key discoveries, and the DSN's historical contribution to the field, see Asmar and Renzetti (1993). The tools of Radio Science can be and have also been utilized in addressing several mission engineering challenges; e.g., characterization of spacecraft nutation and anomalous motion, antenna calibrations, and communications during surface landing phases. Since the first quartz USO was flown on Voyager, the technology has advanced significantly, affording future missions higher sensitivity in reconstructing the temperature pressure profiles of the atmospheres under study as well as other physical phenomena of interest to Radio Science. This paper surveys the trends in stability and spectral purity performance, design characteristics including size and mass, as well as cost and history of these clocks in space.

Author

Oscillators; Deep Space Network; Radio Communication; Experimentation

19980009752 NERAC, Inc., Tolland, CT USA

Leadless Chip Carriers and Devices. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865506; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning leadless chip packages. Assembly methods and apparatus, fabrication methods, and soldering techniques are among the topics considered. Citations are also included for housings and mountings. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Integrated Circuits; Electronic Packaging

19980009764 Sandia National Labs., Albuquerque, NM USA

Areal array jetting device for ball grid arrays

Frear, D. R., Sandia National Labs., USA; Yost, F. G., Sandia National Labs., USA; Schmale, D. T., Sandia National Labs., USA; Essien, M., Sandia National Labs., USA; [1997]; 7p; In English; 7th; Annual Surface Mount International Conference, 7-11 Sep. 1997, San Jose, CA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-1780C; CONF-970977-1; DE97-007915; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Package designs for microelectronics devices have moved from through-hole to surface mount technology in order to increase the printed wiring board real estate available by utilizing both sides of the board. The traditional geometry for surface mount devices is peripheral arrays where the leads are on the edges of the device. As the technology drives towards high input/output (I/O) count (increasing number of leads) and smaller packages with finer pitch (less distance between peripheral leads), limitations on peripheral surface mount devices arise. A solution to the peripheral surface mount issue is to shift the leads to the area under the device. This scheme is called areal array packaging and is exemplified by the ball grid array (BGA) package. In a BGA package, the leads are on the bottom surface of the package in the form of an array of solder balls. The current practice of joining BGA packages to printed wiring boards involves a hierarchy of solder alloy compositions. A high melting temperature ball is typically used for standoff. A promising alternative to current methods is the use of jetting technology to perform monolithic solder ball attachment. This paper describes an areal array jetter that was designed and built to simultaneously jet arrays of solder balls directly onto BGA substrates.

DOE

Printed Circuits; Packaging; Solders

19980009778 NERAC, Inc., Tolland, CT USA

Microwave Power Transmission (Latest Citations from the Searchable Physics Information Notices Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868708; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning studies of microwave power transmission through industrial materials. Citations discuss microwave transmission properties of polymers, superconducting materials, semiconductors, polycrystals, films, and layers. Applications in ion implantation, superconducting devices, waveguides, semiconductor devices, plasma diagnostics, photoresist etching, and microwave power supplies are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Microwave Transmission; Microwave Power Beaming

19980009841 NERAC, Inc., Tolland, CT USA

Cathodic Protection (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868740; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of cathodic protection techniques and equipment for corrosion control. Applications include marine vessel hulls, heat exchangers, underground pipelines, and steel reinforcing structures. Theoretical aspects of the electrochemistry of cathodic protection are also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Cathodic Coatings; Bibliographies

19980009842 Sandia National Labs., Albuquerque, NM USA

Amp-hour counting control for PV hybrid power systems

Hund, T. D., Sandia National Labs., USA; Thompson, B., Biri Systems, USA; 1997; 4p; In English; 26th; IEEE Photovoltaic Specialists Conference, 29 Sep. - 3 Oct. 1997, Anaheim, CA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-1160C; CONF-970953-1; DE97-007467; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The performance of an amp-hour (Ah) counting battery charge control algorithm has been defined and tested using the Digital Solar Technologies MPR-9400 microprocessor based PV hybrid charge controller. This work included extensive field testing of the charge algorithm on flooded lead-antimony and valve regulated lead-acid (VRLA) batteries. The test results after one-year have demonstrated that PV charge utilization, battery charge control, and battery state of charge (SOC) has been significantly improved by providing maximum charge to the batteries while limiting battery overcharge to manufacturers specifications during variable solar resource and load periods.

DOE

Battery Chargers; Lead Acid Batteries

19980009881 Naval Postgraduate School, Monterey, CA USA

Integrated Optical Fiber Lattice Accumulators

Atherton, Adam F., Naval Postgraduate School, USA; Mar. 1997; 75p; In English

Report No.(s): AD-A330557; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Sigma-delta modulators track a signal by accumulating the error between an input signal and a feedback signal. The accumulated energy is amplitude analyzed by a comparator. The comparator output signal is fed back and subtracted from the input signal. This thesis is primarily concerned with designing accumulators for inclusion in an optical sigma-delta modulator. Fiber lattice structures with optical amplifiers are used to perform the accumulation. Two fiber lattice structures are designed, modeled, tuned, tested, and characterized. The testing results for both models are plotted and tabulated. One result is that accumulation is inversely proportional to coupling ratio. Also, the optical gain necessary to drive either fiber lattice structure to a monotonically increasing response is identical. With less than 10 (113 of optical gain, a wide range of accumulation rates are available. Initial integration

of one fiber lattice structure into a first-order sigma-delta modulator is accomplished with results consistent with those from an ideal model. The design for a second-order sigma-delta modulator is developed, tested, and preliminary results shown.

DTIC

Optical Fibers; Light Amplifiers; Accumulators

19980009937 NERAC, Inc., Tolland, CT USA

High Voltage Transformers: Latest Citations from the INSPEC Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863055; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning materials and performance of insulators used for high voltage transformers. Topics examine use of mica-fibers, gases, mica filled epoxies, and ceramics. Effects of insulation aging are reviewed, and acceptance testing of high voltage power transformers and apparatus is also examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Insulators; Transformers

19980010034 Notre Dame Univ., Dept. of Electrical Engineering, IN USA

Fifth International Workshop on Computational Electronics Final Report, 1 Sep. 1996 - 31 Aug. 1997

Prod, Wolfgang, Notre Dame Univ., USA; Sep. 1997; 177p; In English; 5th, 28-30 May 1997, University of Notre Dame, IN, USA
Contract(s)/Grant(s): DAAH04-96-I-0337

Report No.(s): AD-A332028; ARO-36171.1-EL-CF; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The Fifth International Workshop on Computational Electronics (IWCE-5) was held on the campus of the University of Notre Dame, May 28-30, 1997. As in previous IWCE meetings, the workshop covered all aspects of advanced simulation of electronic transport in semiconductors and semiconductor devices, particularly those which use large computational resources. More specifically, IWCE-5 focused on the following three major themes: (1) Device Simulation, (2) Optoelectronics, and (3) Quantum Simulation. IWCE-5 attracted 168 registered participants, and featured 15 invited speakers, 40 oral presentations, and 75 poster papers. As a novelty, IWCE-5 included an evening session with hands-on software demonstrations. Sponsorship for IWCE-5 was provided by the National Science Foundation, the Office of Naval Research, the Army Research Office, and the Notre Dame Department of Electrical Engineering and the College of Engineering. These funds were used for invited speakers (travel, registration, and lodging), partial student travel support, publication and mailing costs (including the abstract booklet and the forthcoming proceedings), conference facilities, and for local support (supplies and travel to NCCE at the Beckman Institute for W. Porod).

DTIC

Conferences; Semiconductor Devices; Quantum Electronics; Computerized Simulation

19980010052 Massachusetts Inst. of Tech., Cambridge, MA USA

Structural Shape Estimation Using Shaped Sensors Final Report, 1 Feb. 1994 - 31 Jul. 1996

Andersson, Mark S., Massachusetts Inst. of Tech., USA; Crawley, Edward F., Massachusetts Inst. of Tech., USA; Dec. 20, 1996; 69p; In English

Contract(s)/Grant(s): F49620-94-I-0160

Report No.(s): AD-A329675; AFOSR-97-0354TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The estimation of the global shape of intelligent structures using an array of shaped sensors is investigated. The design of these sensors and their functional requirements are discussed. It is found that certain spatially averaging strain sensors can be used to satisfy these requirements. The output and transfer function characteristics of spatially averaging sensors with arbitrary spatial weightings are given for a sinusoidal and exponential strain fields desirable spatial weightings are then identified. A number of integration schemes used to process sensor measurements and estimate global shape are described. These schemes are then used with spatially averaging sensors to estimate the shape of pinned-pinned and clamped-free beams. Evanescent components in the modeshapes of the clamped-free beam make it more difficult to estimate the shape at low frequencies while ensuring reduced observability of the sensors to higher order modes. A measurement near the root is determined to be important, as is the use of shaped sensors. Finally, an experiment using a clamped-free beam fitted with a number of point and shaped strain sensors was conducted to verify that accurate modeshape estimation can be performed.

DTIC

Functional Design Specifications; Measure and Integration; Smart Structures; Transfer Functions; Vibration Mode

19980010181 Navy Experimental Diving Unit, Panama City, FL USA

Further Evaluation of a Lithium Battery in the MK 16 MOD 0 Underwater Breathing Apparatus (UBA)

Poladian, R. W., Navy Experimental Diving Unit, USA; Mazzone, R. W., Navy Experimental Diving Unit, USA; Nov. 1997; 45p; In English

Report No.(s): AD-A332243; NEDU-TR-10-97; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The MK 16 Underwater Breathing Apparatus (UBA) is an electronically controlled mixed gas rebreather. To meet projected mission requirements, Naval Special Warfare Command (CONNAVSPECWARCOM) tasked Naval Surface Warfare Center, Crane Division (NSWC) to develop a MK 16 UBA battery pack with a nominal duration of 160 hrs. Subsequently, Naval Sea Systems Command (NAVSEA) tasked Navy Experimental Diving Unit (NEDU) to evaluate the prototype 9 volt lithium batteries developed by NSWC. Testing was conducted at NSWC Crane and the results reported in NEDU Technical Report 4-96. As a result of this report, program Executive Office, Carriers, Littoral Warfare and Auxiliary Ships (PEO-CLA) PMS-325J submitted a deviation from specification from Explosive Ordnance Disposal Technical Division requesting authorization for Naval Special Warfare to use the new lithium batteries in lieu of the current lead acid batteries. A review of NEDU Technical Report 4-96 together with additional in-house testing yields the following conclusions: The lithium battery has a duration of about 120 hrs with a MK 16 UBA in a steady green mode. If the primary display indicates flashing red and green, remaining battery duration is on the order of 6 hrs.

DTIC

Warfare; Breathing Apparatus; Lithium Sulfur Batteries; Lead Acetates; Separators

19980010182 Rice Univ., Dept. of Electrical and Computer Engineering, Houston, TX USA

Monolithic Millimeter-Wave Radiating Systems and Feed Networks Final Report, 1 Jul. 1991 - 30 Apr. 1997

Jackson, David R., Rice Univ., USA; Long, Stuart A., Rice Univ., USA; Williams, Jeffrey T., Rice Univ., USA; Oct. 1997; 24p; In English

Contract(s)/Grant(s): DAAL03-91-G-0115

Report No.(s): AD-A332254; ARO-27304.9-EL; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The unifying theme of the research undertaken during the course of this contract is the design of monolithic antennas suitable for millimeter wave operation, and also certain aspects of feed network design at millimeter wave frequencies. The main focus of the antenna design projects was the investigation of planar leaky wave antennas consisting of either dielectric layers or periodic screens. These antennas offer the advantages of simplicity and efficiency at millimeter wave frequencies. Several different types of leaky wave antennas were developed and characterized, and shown to be very useful at millimeter wave frequencies. Other useful types of antennas that are suitable for either microwave or millimeter wave operation arose from this research, including new types of antennas that have less surface wave excitation (reduced surface wave antennas), and hence less mutual coupling and spurious radiation. The part of the research that pertained to feed network design focused on exploring the suitability of using conventional printed circuit transmission lines (stripline and microstrip) for millimeter wave operation, where the electrical substrate thickness may be large. In particular, the existence of leaky modes on these printed circuit lines, and their excitation by practical feeds, was examined.

DTIC

Millimeter Waves; Networks; Antenna Design

19980010430 NERAC, Inc., Tolland, CT USA

Electrostatic Discharge (ESD) Prevention and Control in Integrated Circuits. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865605; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning damage to integrated circuit devices during handling, fabrication, and in-circuit operation. Topics include causes and methods of prevention, designs for static and electrostatic discharge (ESD) protection devices and circuits, cost effective procedures for ESD protection, ESD-protection affording packaging techniques, and work station design. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Integrated Circuits; Damage Assessment; Electrostatics

19980010537 New Mexico Univ., Dept. of Electrical Engineering and Computer Science, Albuquerque, NM USA

A Study of Advanced Semiconductor Switch Physics and Technology Final Report, Sep. 1994 - Sep. 1997

Schamiloglu, E., New Mexico Univ., USA; Fleddermann, C. B., New Mexico Univ., USA; Focia, R., New Mexico Univ., USA; Gaudet, J., New Mexico Univ., USA; Sep. 19, 1997; 48p; In English

Contract(s)/Grant(s): F29601-94-K-0195; AF Proj. 5797

Report No.(s): AD-A331914; PL-TR-97-1151; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Russian ultra-fast, solid state switch technology was investigated in this study. Drift step recovery diodes (DSRDs) with silicon avalanche shapers (SASs) were experimentally examined. In addition, the SAS was studied using device-level modeling. The experiments and model results were compared with each other and with the Russian theory of operation. This research demonstrated that the Russian theory of the SAS was inconsistent with the operational behavior and circuit simulation. The SAS operates in a manner more consistent with a TRAPATT (TRApped Plasma Avalanche Triggered Transit) device. A simple circuit used to test the DSRD and SAS device is presented. Lifetime test results and switching voltage waveforms are discussed and evaluated. An optimum design for the SAS is offered based upon the theory of operation and code simulations. The University of New Mexico's drift diffusion furnace was used to construct a series of avalanche shapers similar in behavior to the Russian SAS. The results of this effort, including experimental data, are presented. Finally, a variety of commercialization opportunities for this fast semiconductor switch technology is offered.

DTIC

Step Recovery Diodes; Semiconductor Devices; Solid State Physics

19980010546 Department of the Navy, Washington, DC USA

Electrical Power Devices Cooling Technique

Sines, Eddie, Inventor, Department of the Navy, USA; Sep. 30, 1997; 18p; In English

Patent Info.: US-Patent-Appl-SN-940179

Report No.(s): AD-D018620; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The apparatus for cooling a high power electrical transformer and electrical motors uses thermally conductive material interleaved between the turn layers of a high power transformer and iron core laminates to provide a low resistant thermal path to ambient. The strips direct excess heat from within the interior to protrusions outside of the windings and core where forced air or thermally conductive potting compound extracts the heat. This technique provides for a significant reduction of weight and volume along with a substantial increase in the power density while operating at a modest elevated temperature above ambient.

DTIC

Patent Applications; Electric Motors; Transformers; Cooling; Ventilation Fans

19980010613 NERAC, Inc., Tolland, CT USA

Cleaning of Semiconductor Devices Prior to Encapsulation (Latest Citations from the INSPEC Database)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863147; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning surface cleaning processes and systems in semiconductor device manufacture prior to packaging or encapsulation. Citations discuss surface treatment of semiconductor substrates, silicon wafers, chip components, and integrated circuits. Treatment methods include use of chemicals and solvents, lasers, ultrasonics, plasmas and gases, and high temperature dry oxidation. Ultraclean technology for ULSI (ultralarge scale integration) fabrication is examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Cleaning; Microelectronics; Semiconductor Devices

19980010615 NERAC, Inc., Tolland, CT USA

Microwave Switches and Attenuators. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866595; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning microwave frequency switches and attenuators. Topics include use in switching radio frequency signals inside both semiconductor components and antennas, and applications where high frequency signal switching or attenuation is necessary. Pin diode or pin switches are the most popular device used, with field effect transistors (FET)

and high power switching included. Some waveguide attenuators are also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Semiconductor Devices; Microwave Equipment

19980010659 Paul Drude Inst. for Solid State Electronics, Berlin, Germany

Paul Drude Institute for Solid State Electronics. Scientific Report Annual Report, 1 Jan. - 31 Dec. 1996

1997; 94p; In English; No Copyright; Avail: Issuing Activity (Paul-Drude Institut fuer Festkoerperelektronik, im Forschungsverbund Berlin e.V., Hausvogteiplatz 5-7, D-10117 Berlin, Germany), Hardcopy, Microfiche

This scientific report contains on the white pages comprehensive reviews of our research activities. which are divided in three sections. The publications are compiled on the blue pages. The list of seminars presented by visitors, the summary of the budget and of external funding as well as the list of international visiting scientists and of the staff can be found on the green pages. Following the recommendation of the scientific advisory board, the development of blue light emitters and lasers on the basis of GaN has become a major focus of our activities. A newly developed molecular beam epitaxy system with a plasma source has been put into operation. Growth rates up to 0.8 micron/h can be achieved with this equipment. A number of (Al,Ga)N/(Ga,In)N heterostructures has been synthesized, and their optical properties have been investigated. In order to achieve a quantitative understanding of the dominant electron-hole recombination processes in GaN, time-resolved photoluminescence experiments have been performed. These measurements can be used to determine the radiative and non-radiative lifetimes and consequently the internal quantum efficiency of the GaN layers. The correlation between growth conditions, defect structure, and quantum efficiency will be further investigated and forms the basis for the development and optimization of devices. The research on GaN is currently still oriented towards a basic understanding of device operation, where different substrate materials (GaAs, SiC, LiAlO₂, LiGaO₂) as well as conceptual and technological problems are most important. This research is conducted in close collaboration with the Ferdinand Braun Institute in Berlin and the Fraunhofer Institute for Applied Solid State Physics in Freiburg. It also forms the basis for a collaboration with industry. In order to understand the complex processes of crystal growth during the formation of interfaces and during doping, methods with atomic resolution such as scanning tunneling and scanning force microscopy have been applied. to investigate metastable surface configurations, special preparation methods have been developed, which have also been made available to research groups outside the institute. The research activities in the area of solid state acoustics have been focused on the micro- and nanoscopic investigation and determination of the elastic properties of single crystal materials near the surface and of thin layers. The non-destructive, spatially resolved measurement of surface acoustic wave parameters was made possible using scanning probe methods (SATM, SAFM) developed within the institute. Using a model system for which the phase velocity of surface acoustic waves was measured over a distance of only 20 nm and for which the velocity dispersion was determined with high accuracy, the investigations were extended to the layer system AlAs/GaAs.

Derived from text

Plasmas (Physics); Research Facilities; Acoustic Measurement; Emitters; Product Development; Industries

19980010760 Columbia Univ., Dept. of Chemistry, New York, NY USA

The Incandescent Light Bulb

Fine, Leonard W., Columbia Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 261-268; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The objectives of the study are to observe the air oxidation of incandescent tungsten filaments and to describe the design and construction of the modern light bulb, stressing chemical and materials properties.

Derived from text

Luminaires; Illumination; Filaments; Metallurgy; Oxidation; Tungsten

19980010761 Lehigh Univ., Dept. of Materials Science and Engineering, Bethlehem, PA USA

Learning About Electric Dipoles From a Kitchen Microwave Oven

Jain, Himanshu, Lehigh Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 269-276; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Our common experience shows that the temperature of a material increases when it absorbs electromagnetic radiation. The passive solar heating of water and brewing of tea in a glass jar by sunlight are just two illustrations of this process. Is the food in a microwave oven heated by the same process? The answer is yes, to the extent that the food is heated by the absorption of electromagnetic radiation of microwave frequencies. At the same time we know that cold water kept in a thermally insulated opaque flask will not warmup by keeping it in the sun but will readily heat up in a microwave oven. So the exact mechanism of absorption of sunlight and microwaves by materials must be somewhat different. The present experiment is designed to demonstrate the funda-

mental aspects of microwave heating and, in turn, to elucidate the dipolar dielectric loss phenomenon at the molecular level. The emphasis is on the basic physics and the use of common inexpensive instrumentation and materials, rather than the accuracy of results. The students are also exposed to some of the issues dealing with the microwave processing of materials. Due to the familiarity with the experiment there is greater excitement for learning and, the students appear to remember the underlying principles more than from sophisticated experiments.

Derived from text

Electric Dipoles; Microwaves; Dielectrics; Losses; Heating; Electromagnetic Absorption; Microwave Attenuation; Microwave Frequencies

19980010831 Yale Univ., Dept. of Electrical Engineering, New Haven, CT USA

Self-Assembly Based Approaches to Microelectronic Fabrication and Devices: Surface Passivation, Soft Lithography, Electrically Functional Systems, and Hierarchical Self-Assembly

Allara, David, Yale Univ., USA; Maracas, George, Yale Univ., USA; Reed, Mark, Yale Univ., USA; Tour, James, Yale Univ., USA; Nov. 17, 1997; 48p; In English

Contract(s)/Grant(s): N00014-95-I-1182; AF Proj. 1651

Report No.(s): AD-A332568; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Self-Assembly Based Approaches to Microelectronic Fabrication and Devices: Surface Passivation, Soft Lithography, Electrically Functional Systems, and Hierarchical Self-Assembly

Derived from text

Lithography; Microelectronics

19980010841 Farr Research, Albuquerque, NM USA

Design Considerations for Ultra-Wideband, High-Voltage Baluns Final Report, Mar. 1993 - Oct. 1994

Farr, Everett G., Farr Research, USA; Sower, Gary D., Farr Research, USA; Buchenauer, C. J., Farr Research, USA; Oct. 1994; 38p; In English

Contract(s)/Grant(s): F29601-94-C-0059; AF Proj. 3005

Report No.(s): AD-A332114; PL-TR-97-1124; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We consider how to build a balun for fast-risetime pulses at high voltage. We are concerned about signals with risetimes on the order of 100-200 ps with high peak voltages and peak powers. We propose the simplest method is a coaxial unzipper. We consider (1) the dielectric strength and maximum coaxial radius allowable while still maintaining the risetime, and (2) methods to reduce the coupling to the common mode. Finally, we calculate the peak electric field and characteristic impedance of the coaxial unzipper at various points along its length using a two-dimensional finite element code. The results of this design will be used to build an ultrawideband antenna system.

DTIC

Antenna Design; Dielectric Properties; Electrical Impedance; Finite Element Method

19980010850 Farr Research, Albuquerque, NM USA

Design Considerations for Ultra-Wideband, High-Voltage Baluns Final Report, Feb. 1995 - Apr. 1997

Farr, Everett G., Farr Research, USA; Sower, Gary D., Farr Research, USA; Atchley, L. M., Farr Research, USA; Ellibee, D. E., Farr Research, USA; Sep. 1997; 32p; In English

Contract(s)/Grant(s): F29601-95-C-0160; AF Proj. 3005

Report No.(s): AD-A331997; PL-TR-97-1144; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have built and tested a coaxial zipper that can be used at high voltages. This device is designed to convert the signal from a single-ended (unbalanced coaxial) high-voltage output of ultrawideband sources to a balanced configuration that can be radiated by a transverse electromagnetic (TEM) horn. A variety of low voltage measurements was performed, including time domain reflectometer (TDR) and field measurements. The field at large distances was estimated from the measured data.

DTIC

Broadband; Electrical Measurement; Estimating; High Voltages; Zippers

19980010852 NERAC, Inc., Tolland, CT USA

Linear Motors: Theory, Analysis, and Modeling. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866579; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the theory and applications of linear motors and related components and systems. Analytical and computational approaches to the characteristics, behavior, and performance of linear motors and their components are considered. Citations pertaining specifically to the use of linear motors in transportation vehicles and systems are excluded. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Electric Motors

19980010873 Rochester Univ., Dept. of Electrical Engineering, NY USA

The Charging Effect in High-Tc Superconducting Thin Films Final Report, 1 Jan. 1994 - 30 Jun. 1997

Sobolewski, Roman, Rochester Univ., USA; Oct. 07, 1997; 10p; In English

Contract(s)/Grant(s): F49620-94-I-0094

Report No.(s): AD-A331432; AFOSR-97-0578TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The main objective of this grant was to conduct a careful and exhaustive experimental examination of the charging effect in high-temperature superconducting (HTS) thin films and perform research on novel superconducting electronic and optoelectronic devices operational at liquid-nitrogen temperatures. For this purpose, we developed a new, laser-based approach to processing of YBa₂Cu₃O_x (YBCO) thin films, exploiting the contrasting optical and electrical properties of the oxygen-poor (semiconducting) and oxygen-rich (superconducting) YBCO phases. Using laser writing, we fabricated, superconducting SuperFET structures, which consisted of a channel based on partially oxygen-depleted material or a Josephson weak-link and fully superconducting source and drain electrodes. We also developed microwave transmission lines, structures with nonuniform oxygen doping profiles, and photodetectors based on YBCO films containing regions with different oxygen contents. The physical mechanisms behind the performance of our test structures were investigated with the emphasis on their electrical and optoelectronic properties. Our interest was extended to studies of laser induced modifications of YBCO Josephson junctions and photoinduced oxygen reordering within grain-boundary weak links. Our basic physics experiments were aimed to investigate superconducting transport and superconducting fluctuations in HTS materials, especially in case of partially oxygen-depleted materials, when carriers were optically created.

DTIC

Additives; Barium Oxides; Copper Oxides; Depletion; Drainage; Electrical Properties; Electrodes; Exhausting; Fabrication; Grain Boundaries; High Temperature Superconductors; Liquid Nitrogen; Microwave Transmission

19980010876 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Application of Thin Films of Conjugated Polymers in Novel LED's and Liquid Crystal 'Light Valves'

MacDiarmid, A. G., Pennsylvania Univ., USA; Wang, H. L., Pennsylvania Univ., USA; Huang, F., Pennsylvania Univ., USA; Avlyanov, J. K., Pennsylvania Univ., USA; Wang, P. C., Pennsylvania Univ., USA; Swager, T. M., Pennsylvania Univ., USA; Huang, Z., Pennsylvania Univ., USA; Vergo, T. G., Geo-Centers, Inc., USA; Epstein, A. J., Ohio State Univ., USA; Wang, Y. Z., Ohio State Univ., USA; Gebler, D. D., Ohio State Univ., USA; Shashidhar, R., Naval Research Lab., USA; Calvert, J. M., Naval Research Lab., USA; Crawford, R. J., Naval Research Lab., USA; Wynne, K. J., Office of Naval Research, USA; Whitesides, G. M., Harvard Univ., USA; Xia, Y., Harvard Univ., USA; Sep. 20, 1997; 6p; In English

Contract(s)/Grant(s): N00014-95-1-0302; N00014-92-J-1369

Report No.(s): AD-A330190; TR-P278; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Light emitting electroluminescent devices have been studied in which the conjugated light emitting polymer is separated on both sides from the device electrodes by a film of non-conducting polyaniline. The devices operate under an AC applied potential. Aluminum, copper, or gold serve as the metal electrodes. Flexible, completely organic polymer dispersed liquid crystal light valves have been fabricated from transparent plastic substrates on which a conducting film of polypyrrole has been deposited. A new concept, 'microcontact printing', is being investigated for patterning the polypyrrole.

DTIC

Light Emitting Diodes; Liquid Crystals; Thin Films; Light Valves; Conducting Polymers; Dipping

19980010879 Ohio State Univ., Dept. of Physics, Columbus, OH USA

Application of Aluminum, Copper and Gold Electrodes in AC Polymer Light-Emitting Devices

Wang, H. L., Ohio State Univ., USA; Huang, F., Ohio State Univ., USA; MacDiarmid, A. G., Ohio State Univ., USA; Wang, Y. Z., Ohio State Univ., USA; Gebler, D. D., Ohio State Univ., USA; Sep. 20, 1997; 10p; In English

Contract(s)/Grant(s): N00014-92-J-1369; N00014-95-1-0302

Report No.(s): AD-A330198; TR-P303; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Symmetrically configured a.c. light-emitting (SCALE) '5-layer' devices having the configuration M/EB/P/EB/ITO, where M=Al, Cu or Au, EB=polyaniline (emeraldine base), P=poly(2,5-dihexadecanoxo phenylene vinylene pyridyl vinylene) or PPV-PPyV, and ITO = indium-tin oxide glass, show electroluminescent properties in both forward and reverse bias modes. In the absence of emeraldine base, in the case of aluminum and copper, electroluminescence is observed only in the forward bias mode; in the case of gold no electroluminescence is observed in either forward or reverse bias modes. The electrical properties of the '5-layer' devices (M=Al, Cu) are most surprising since their total resistance at a given applied voltage is significantly less than that of the corresponding devices in which the two polyaniline insulator layers are not present.

DTIC

Polymers; Light Emitting Diodes; Aluminum; Copper; Electrodes; Gold; Alternating Current

19980010884 Stanford Univ., Dept. of Electrical Engineering, Stanford, CA USA

Application of Modern Signal Processing to Semiconductor Manufacturing and Phase Mask Design Final Report, 31 Dec. 1996 - 1 Sep. 1997

Kailath, Thomas, Stanford Univ., USA; Jan. 17, 1997; 9p; In English

Contract(s)/Grant(s): F49620-93-I-0566

Report No.(s): AD-A332640; AFOSR-97-0619TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The semiconductor manufacturing industry faces the need for tighter control of thermal budget and process variations as circuit feature sizes decrease. Strategies to meet this need include supervisory control, run-to-run control, and real-time feedback control. Typically, the level of control chosen depends upon the actuation and sensing available. Rapid Thermal (RTP) is one step of the manufacturing cycle requiring precise temperature control and hence real-time feedback control. At the outset of this research, the primary ingredient lacking from in-situ RTP temperature control was suitable sensor. This research looks at an alternative to the traditional approach of pyrometry, which is limited by the unknown and possibly time-varying wafer emissivity. The technique is based upon the temperature dependence of the propagation time of an acoustic wave in the wafer. The aim of this thesis is to demonstrate that ultrasonic sensors are a viable sensor for control in RTP. To do this, an experimental implementation was developed at the Center for Integrated Systems. Because of the difficulty in applying a known temperature standard in an RTP environment, calibration to absolute temperature is nontrivial. Given reference propagation delays, multivariable model-based feedback control is applied to the system. The modelling and implementation details are described. The control techniques have been applied to a number of research processes including rapid thermal annealing and rapid thermal crystallization of thin silicon films on quartz/glass substrates.

DTIC

Ambient Temperature; Annealing; Control Systems Design; Crystallization; Emissivity; Feedback Control; Model Reference Adaptive Control

19980010923 Army Communications-Electronics Command, Fort Monmouth, NJ USA

Battery Compartment Design Guidelines for Equipment Using Lithium-Sulfur Dioxide Batteries

Kiernan, David, Army Communications-Electronics Command, USA; Oct. 1997; 40p; In English

Report No.(s): AD-A331661; CECOM-TB-7-Rev-A; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This Technical Bulletin (TB) provides guidelines for the proper design and test of battery compartments housing lithium-sulfur dioxide (LiSO₂) batteries to minimize injuries as a result of violent battery ventings. A description of LiSO₂ batteries and associated hazards is included to inform the reader why these battery compartments may be necessary. Also addressed is the risk assessment process and evaluation parameters for determining if a battery compartment designed and tested in accordance with this TB is required. Battery compartment design recommendations to minimize equipment damage and injury as a result of violent ventings that may occur when the batteries are installed in equipment are addressed in detail. Equipment design recommendations are also provided to minimize the chances of a violent battery incident from occurring when installed in the equipment. Test guidelines, including determination of test pressures and proper use of associated formulas, are included.

DTIC

Compartments; Design Analysis; Performance Tests; Lithium Sulfur Batteries

19980010956 International Trade Commission Library, Washington, DC USA

In the Matter of Certain Hardware Logic Emulation Systems and Components Thereof. Investigation No. 337-TA-383. Modification of Temporary Exclusion Order (November 1997)

Nov. 1997; 34p; In English

Report No.(s): PB98-111297; USITC/PUB-3074; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Notice is hereby given that the Commission has determined to grant complainant's petition to modify respondents' temporary relief bond in the above-captioned investigation. Respondents' temporary relief bond for all entries made since issuance of temporary relief in this investigation remains at 43 percent of the entered value of the subject imported articles if entered value equals transaction value as defined in applicable U.S. Customs Service regulations. Respondents' temporary relief bond for all entries made since issuance of temporary relief in this investigation is increased to 180 percent of the entered value of the subject imported articles if entered value does not equal transactions value as defined in applicable U.S. Custom Service regulations. The products at issue are hardware logic emulation systems that are used in the semiconductor manufacturing industry to test electronic circuit designs for semiconductor devices.

NTIS

International Trade; Semiconductor Devices; Hardware; Automatic Test Equipment

19980010974 Warner Robins Air Logistics Center, Robins AFB, GA USA

Incorporation of a Linear Drive Cryogenic Cooler into the AN/AAR-44 Infrared Warning Receiver *Final Report*

Farrier, David, Warner Robins Air Logistics Center, USA; Aug. 08, 1994; 25p; In English

Report No.(s): AD-A331725; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The cryogenic coolers used in many infrared systems are the systems' Achilles heel in terms of reliability. We demonstrated a new technology linear drive cooler in an AN/AAR-44 missile warning receiver. Although this modification will not be fielded in the AAR-44, many optically guided missiles, targeting systems, night vision devices, and commercial thermal imaging systems employ similar cooled detectors. We present this report in the hope that the results will be useful to some of the numerous other systems that employ cryogenic coolers. The AAR-44 is an electro-optical system used on about 100 specially equipped C-130 and C-141 aircraft. When designed in the late 1970s, it employed a state-of-the-art sterling cycle rotary drive cryogenic cooler. Production in the 1980s used an improved reliability rotary cooler, incorporating better processes and materials and a temperature control circuit. However, the cooler still contributed half of the failures and most of the maintenance cost WR-ALC/LNXEA initiated this project when a new generation of off-the-shelf linear drive coolers became available in the late 1980s. Discussions with the AAR-44 contractor, Cincinnati Electronics, revealed that a new insulating dewar (thermos bottle) would further enhance reliability.

DTIC

Infrared Radiation; Electro-Optics; Cryogenic Cooling; Imaging Techniques; Thermal Mapping; Infrared Instruments

19980011584 Technische Univ., Lab. of Electromagnetic Research, Delft, Netherlands

Note on the Uniqueness of a Class of Non-Linear Electro- and Magnetostatic Field Problems

deHoop, A. T., Technische Univ., Netherlands; Lager, I. E., Technische Univ., Netherlands; Sep. 1996; 24p; In English

Report No.(s): PB97-204713; ET/EM-1996-26; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The uniqueness properties of a class of non-linear electro- and magnetostatic problems are analyzed. The study was motivated by the development of numerical algorithms to solve electro- and magnetostatic problems in engineering configurations with non-linear media. Here, existence and uniqueness of the solution are prerequisites for the numerical results to have any meaning at all.

NTIS

Magnetostatic Fields; Electric Fields

19980011589 Central Lab. of the Research Councils, Warrington, UK

Infrastructure and Technology Transfer Programmes for Microtechnology in the UK

Tolfree, D. W. L., Central Lab. of the Research Councils, UK; Apr. 1997; 51p; In English; Conference on the Commercialisation of Microsystems 1996, 6-11 Oct. 1996, Kona, HI, USA

Report No.(s): PB97-164719; DL-TR-97-001; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

Contents include the following: The Executive Outlook; Commercialization Strategies For Advanced Technologies; Technology Push Versus Market Pull; Regional MEMS Commercialization Policy and Strategies; Packaging, Standards and Integration; Why Companies Choose to Use, or Not Use, MEMS Technologies; Commercialization Problems in an Emergent Technological Base; and MEMS Business Development.

NTIS

Microelectronics; Technology Transfer; Micromachining

19980011596 National Inst. of Standards and Technology, Gaithersburg, MD USA

Beyond the Technology Roadmaps: An Assessment of Electronic Materials Research and Development

Schen, M. A., National Inst. of Standards and Technology, USA; Russell, T. J., National Inst. of Standards and Technology, USA; Leheny, R. F., Advanced Research Projects Agency, USA; Simon, H., Commerce Dept., USA; Hess, V., National Science Foundation, USA; Borsuk, G., Naval Research Lab., USA; Mar. 1996; 60p; In English

Report No.(s): PB96-165998; NISTIR-5777; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report, produced by the National Science and Technology Council, Electronic Materials Working Group, captures the findings of the December 6-7, 1994 industry-government-university Workshop on Electronic Materials held in Dallas, TX. It provides summary of the dominant electronics materials issues facing U.S. industry and contains recommendations critical to the advancement and competitiveness of the U.S. electronics and materials industries. The technologies encompassed within this report are microelectronics, radio frequency and microwave electronics, photonics, mass storage, and module interconnection. In addition, materials characterization and materials research, two areas essential to the understanding, discovery and utilization of materials, are included.

NTIS

Microelectronics; Photonics; Radio Frequencies; Microwaves

19980011601 National Inst. of Standards and Technology, Semiconductor Electronics Div., Gaithersburg, MD USA

Electronics and Electrical Engineering Laboratory Technical Publication Announcements Covering Laboratory Programs, July to September 1995 with 1996 EEEL Events Calendar, Jul. - Sep. 1995

Rohrbaugh, J. M., National Inst. of Standards and Technology, USA; Apr. 1996; 26p; In English

Report No.(s): PB96-183066; NISTIR-5816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the forty-sixth issue of a quarterly publication providing information on the technical work of the National Institute of Standards and Technology, Electronics and Electrical Engineering Laboratory. This issue of the EEEL Technical Publication Announcements covers the third quarter of calendar year 1995. Abstracts are provided by technical areas for papers published.

NTIS

Electrical Engineering; Research Projects

19980011619 Japan Atomic Energy Research Inst., Dept. of Fusion Engineering Research, Tokyo, Japan

Effect of current imbalance on stability of a cable-in-conduit conductor consisting of chrome-plated strands

Koizumi, Norikiyo, Japan Atomic Energy Research Inst., Japan; Takahashi, Yoshikazu, Japan Atomic Energy Research Inst., Japan; Nishi, Masataka, Japan Atomic Energy Research Inst., Japan; Isono, Takaaki, Japan Atomic Energy Research Inst., Japan; Tsuji, Hiroshi, Japan Atomic Energy Research Inst., Japan; Ono, Michitaka, Toshiba Corp., Japan; Hamajima, Takataro, Toshiba Corp., Japan; Fujioka, Tsutomu, Toshiba Corp., Japan; Feb. 1997; 21p; In English

Report No.(s): JAERI-Research-97-002; DE97-745410; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effect of an unbalanced current distribution in a conductor consisting of chrome plated strands on stability was investigated using a cable-in-conduit conductor (CICC) consisting of 27 NbTi chrome-plated strands. In addition, the quench behavior when a non-uniform current distribution was produced in the conductor was studied from the experimental results. Moreover, impedance of the chrome-plated strands was measured using the sample conductor. The results show that the stability is determined by the largest strand current when it is sufficiently large otherwise by the transport current when it is not high enough. It was found that it took a long time to make the conductor quench from the onset of the normal transition of the strand carrying the large current. This is explained by the good diffusivity of the coolant temperature in the conductor's cross section. Since the ramp-rate limitation cannot probably take place if the coolant temperature is diffused well in the conductor's cross section, it is expected the ramp-rate limitation can be prevented using this effect. It is also shown that the chrome-plated strands come into contact with one another with uniform transverse conductance on the order of 10(sup 3) S/m. (author)

DOE

Current Distribution; Stability; Superconductors (Materials)

19980011632 Japan Atomic Energy Research Inst., Dept. of Fusion Plasma Research, Tokyo, Japan

The design study of the JT-60SU device, No. 7, The ECRF System of JT-60SU

Yamamoto, Takumi, Japan Atomic Energy Research Inst., Japan; Ushigusa, Kenkichi, Japan Atomic Energy Research Inst., Japan; Sakamoto, Keishi, Japan Atomic Energy Research Inst., Japan; Imai, Tsuyoshi, Japan Atomic Energy Research Inst., Japan; Miya, Naoyuki, Japan Atomic Energy Research Inst., Japan; Kurita, Gen-ichi, Japan Atomic Energy Research Inst., Japan; Nagashima, Keisuke, Japan Atomic Energy Research Inst., Japan; Kitai, Tatsuya, Japan Atomic Energy Research Inst., Japan; Mori, Katsuharu, Japan Atomic Energy Research Inst., Japan; Kikuchi, Mitsuru, Japan Atomic Energy Research Inst., Japan;

Nagami, Masayuki, Japan Atomic Energy Research Inst., Japan; Feb. 1997; 82p; In Japanese
Report No.(s): JAERI-Research-97-006; DE97-750677; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The ECRF system is composed of two sub-systems. The one of them is the ECR preionization and discharge cleaning sub-system which assists ramp up of plasma current during start-up and cleans up the first wall under high magnetic fields. The other is ECH heating sub-system which is used to heat plasma and drive plasma current efficiently for sustainment of high performance plasma stably in a steady-state. For the two sub-systems, the safety study in treatment of tritium was carried out in JT-60SU. The design study of the antenna system was also performed concerning on shielding radioactive rays, and the investigation of main component such as a gyrotron was done. It is found that the ECRF system can be fabricated at a technological view point. The results of conceptual examination of the ECRF system will be described in this report.

DOE

Tokamak Devices; Design Analysis; Antenna Design; Antenna Components

19980011654 California Univ., Dept. of Applied Sciences, Davis, CA USA

Slotted High-Harmonic Peniotron Oscillator *Final Report, 30 Jun. 1994 - 29 Jun. 1997*

Luhmann, N. C., Jr., California Univ., USA; Oct. 08, 1997; 7p; In English

Contract(s)/Grant(s): F49620-94-I-0396

Report No.(s): AD-A331721; AFOSR-TR-97-0593; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The novel, highly efficient peniotron interaction has been studied experimentally and theoretically. The concept that mode selective circuits can be used to realize high power harmonic gyro-TWT amplifiers, which has been verified by the P.I.'s experimental group, has been extended to peniotrons for the design of an efficient high power peniotron oscillator. The peniotron is predicted to generate 120 kW with an unprecedented conversion efficiency of 63%.

DTIC

Harmonic Oscillators; Microwave Tubes; Energy Conversion Efficiency

34

FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling. For related information see also 02 Aerodynamics and 77 Thermodynamics and Statistical Physics.

19980009319 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

Automated Fluid Feature Extraction from Transient Simulations *Progress Report, 1 Apr. 1997 - 31 Mar. 1998*

Haimes, Robert, Massachusetts Inst. of Tech., USA; Jan. 20, 1998; 38p; In English

Contract(s)/Grant(s): NCC2-985

Report No.(s): NASA/CR-98-206727; NAS 1.26:206727; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the past, feature extraction and identification were interesting concepts, but not required to understand the underlying physics of a steady flow field. This is because the results of the more traditional tools like iso-surfaces, cuts and streamlines were more interactive and easily abstracted so they could be represented to the investigator. These tools worked and properly conveyed the collected information at the expense of much interaction. For unsteady flow-fields, the investigator does not have the luxury of spending time scanning only one 'snap-shot' of the simulation. Automated assistance is required in pointing out areas of potential interest contained within the flow. This must not require a heavy compute burden (the visualization should not significantly slow down the solution procedure for co-processing environments like pV3). and methods must be developed to abstract the feature and display it in a manner that physically makes sense. The following is a list of the important physical phenomena found in transient (and steady-state) fluid flow: Shocks; Vortex cores; Regions of Recirculation; Boundary Layers; Wakes.

Author

Simulation; Flow Distribution; Fluid Flow; Boundary Layers

19980009331 Sandia National Labs., Albuquerque, NM USA

Coherent structures in compressible free-shear-layer flows

Aeschliman, D. P., Sandia National Labs., USA; Baty, R. S., Sandia National Labs., USA; Kennedy, C. A., Sandia National Labs., USA; Chen, J. H., Sandia National Labs., USA; Aug. 1997; 172p; In English

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-2034; DE97-009141; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Large scale coherent structures are intrinsic fluid mechanical characteristics of all free-shear flows, from incompressible to compressible, and laminar to fully turbulent. These quasi-periodic fluid structures, eddies of size comparable to the thickness of the shear layer, dominate the mixing process at the free-shear interface. As a result, large scale coherent structures greatly influence the operation and efficiency of many important commercial and defense technologies. Large scale coherent structures have been studied here in a research program that combines a synergistic blend of experiment, direct numerical simulation, and analysis. This report summarizes the work completed for this Sandia Laboratory-Directed Research and Development (LDRD) project.
DOE

Compressible Flow; Turbulent Flow; Computational Fluid Dynamics; Shear Flow

19980009421 Southwest Research Inst., Mechanical and Fluids Engineering Div., San Antonio, TX USA

Pipeline Purging Principles and Practices Research Final Report, Nov. 1994 - Jun. 1996

Johnson, J. E., Southwest Research Inst., USA; Svedeman, S. J., Southwest Research Inst., USA; Kuhl, C. A., Southwest Research Inst., USA; Jan. 1997; 99p; In English; Figures in this document may not be legible in mic

Contract(s)/Grant(s): GRI-5094-270-3091; SwRI Proj. 04-6915

Report No.(s): PB97-157721; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The program focus is on the purging procedures outlined in Chapter 8 of the Purging Manual entitle Gas Transmission and Distribution Pipe. This Report addresses three critical technical and procedural issues in Chapter 8 needing review and revision. These issues include (1) the development of a velocity criteria for avoiding stratified flow conditions (2) the development of a revised Inlet Control Procedure embodied in Table 8.1 of the Purging Manual, and (3) the application of a gas mixing model for predicting the time to complete direct displacement and inert gas slug purging operations. Mathematical models for calculating stratification velocity, combustible gas mixing length, and purge time are presented with supporting field data. Computer software for planning pipeline purges has been developed and is described in the report. The code can be used to predict the time to complete a purge for common single line piping configurations found in transmission and and distribution systems.

NTIS

Mixing Length Flow Theory; Pipelines; Pipes (Tubes); Purging; Rare Gases; Stratified Flow

19980009504 Argonne National Lab., Energy Technology Div., IL USA

Measurement of shear impedances of viscoelastic fluids

Sheen, Shuh-Haw, Argonne National Lab., USA; Chien, Hual-Te, Argonne National Lab., USA; Raptis, A. C., Argonne National Lab., USA; [1996]; 17p; In English; Ultrasonics Symposium, 3-6 Nov. 1996, San Antonio, TX, USA

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): ANL/ET/CP-91518; CONF-9611113-3; DE97-001392; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Shear-wave reflection coefficients from a solid/fluid interface are derived for non-Newtonian fluids that can be described by Maxwell, Voigt, and power-law fluid models. Based on model calculations, we have identified the measurable effects on the reflection coefficients due to fluid non-Newtonian behavior. The models are used to interpret the viscosity data obtained by a technique based on shear impedance measurement.

DOE

Mechanical Impedance; Impedance Measurement; Wave Reflection; S Waves; Shear Properties; Viscous Flow; Viscoelasticity; Liquid-Solid Interfaces

19980009517 National Inst. of Standards and Technology, Gaithersburg, MD USA

Application of Numerical Grid Generation to Problems in Computational Fluid Dynamics

Saunders, B. V., National Inst. of Standards and Technology, USA; Sep. 1997; 18p; In English

Report No.(s): PB97-210744; NISTIR-6073; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Numerical grid generation, the computation of boundary fitted curvilinear coordinate systems to aid in the numerical solution of partial differential equations is described. Grid generation plays a crucial role in resolving the problem of handling arbitrarily shaped boundaries when solving physical problems over a field. The driving impetus for the development of grid generation techniques was to solve problems in computational fluid dynamics, but grid generation is applicable to any area where partial differential equations are computed over a field. The use and benefits of grid generation are explained. Common types of grid generation

systems are presented and finally, the generation of grids suitable for solving physical problems that arise in solidification theory is examined.

NTIS

Grid Generation (Mathematics); Computational Fluid Dynamics; Boundaries; Spherical Coordinates; Partial Differential Equations

19980009634 Naval Research Lab., Center for Reactive Flow and Dynamical Systems, Washington, DC USA

Computation of the 3-D Unsteady Flow Past Deforming Geometries

Ramamurti, Ravi, George Mason Univ., USA; Sandberg, William C., Naval Research Lab., USA; Lohner, Rainald, Naval Research Lab., USA; Oct. 20, 1997; 24p; In English

Report No.(s): AD-A331865; NRL/MR/6410--97-8101; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A 3-D incompressible unsteady flow solver based on simple finite elements with adaptive remeshing and grid movement for both moving and deforming surfaces is described. We demonstrate the combination of adaptive remeshing technique with the incompressible flow solver by computing the flow past an undulating eel in 2-D and past a swimming bluefin tuna in 3-D. It is clear that proper choice of the amplitude and frequency of undulation is necessary for positive thrust production in the eel. Unsteady flow of the swimming tuna with caudal fin oscillation and quasi-steady state flow at several caudal fin positions are computed. Comparison of these results show that the unsteady flow is considerably different in both magnitude and trend suggesting that unsteady flow about moving deforming bodies is not amenable to spatial decomposition or temporal, quasi-steady approximations.

DTIC

Computational Fluid Dynamics; Unsteady Flow; Incompressible Flow; Flow Distribution; Finite Element Method; Three Dimensional Flow

19980009683 NASA Langley Research Center, Hampton, VA USA

Time Evolution of Modeled Reynolds Stresses in Planar Homogeneous Flows

Jongen, T., Eidgenoessische Technische Hochschule, Switzerland; Gatski, T. B., NASA Langley Research Center, USA; Dec. 1997; 28p; In English

Contract(s)/Grant(s): RTOP 522-31-81-03

Report No.(s): NASA/TM-97-206265; NAS 1.15:206265; L-17672; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The analytic expression of the time evolution of the Reynolds stress anisotropy tensor in all planar homogeneous flows is obtained by exact integration of the modeled differential Reynolds stress equations. The procedure is based on results of tensor representation theory, is applicable for general pressure-strain correlation tensors, and can account for any additional turbulence anisotropy effects included in the closure. An explicit solution of the resulting system of scalar ordinary differential equations is obtained for the case of a linear pressure-strain correlation tensor. The properties of this solution are discussed, and the dynamic behavior of the Reynolds stresses is studied, including limit cycles and sensitivity to initial anisotropies.

Author

Turbulence Models; Nonequilibrium Flow; Reynolds Stress; Computational Fluid Dynamics; Turbulent Flow

19980009771 Boston Univ., Dept. of Aerospace and Mechanical Engineering, Boston, MA USA

A Combined Large-Eddy Simulation and Time-Dependent RANS Capability for High-Speed Compressible Flows

Speziale, Charles G., Boston Univ., USA; Sep. 09, 1997; 35p; In English

Contract(s)/Grant(s): DAAG55-97-I-0123

Report No.(s): AD-A332268; TR-AM-97-022; ARO-36216.1-EG; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An entirely new approach to the Large-Eddy Simulation (LES) of high-speed compressible turbulent flows is presented. Sub-grid scale stress models are proposed that are dimensionless functions of the computational mesh size times a Reynolds stress model. This allows a DNS to go continuously to an LES and then a Reynolds-Averaged Navier-Stokes (RANS) computation as the mesh becomes successively more coarse or the Reynolds number becomes much larger. Here, the level of discretization is parameterized by the non-dimensional ratio of the computational mesh size to the Kolmogorov length scale. The Reynolds stress model is based on a state-of-the-art two-equation model whose enhanced performance is documented in detail in a variety of benchmark flows. It contains many of the most recent advances in compressible turbulence modeling. Applications to the high-speed aerodynamic flows of technological importance are briefly discussed.

DTIC

Compressible Flow; Large Eddy Simulation; Time Dependence; Turbulent Flow; High Speed

19980009824 Minnesota Univ., Dept. of Aerospace Engineering and Mechanics, Minneapolis, MN USA

Dynamics and Stability of Capsules in Pipeline Transportation Final Report, 1994-1995

Zhao, Y., Minnesota Univ., USA; Lundgren, T. S., Minnesota Univ., USA; May 1996; 46p; In English
Report No.(s): PB96-191150; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project studies a new system concept for freight transportation. The idea is to use capsules to transport cargos in concealed pipelines powered by linear electric motors. Such a concept advocates the separation of freight transportation from human movement and can be very effective in reducing the ever-increasing highway congestion problem. The report examines the technical aspects of such a freight pipeline system powered by linear induction motors. Forces acting on a capsule are first discussed, followed by the study of aerodynamic drag forces on a capsule and linear induction thrust forces. Stabilities of both a single capsule and a multiple capsule system are also discussed. These results reveal the basic characteristics of a freight pipeline system, propelled by linear induction propulsion. Various technical issues are discussed.

NTIS

Pipelines; Stability; Dynamic Characteristics; Transportation

19980009882 NERAC, Inc., Tolland, CT USA

Cavitation Flow. (Latest citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867957; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theoretical investigations and applications of cavitation phenomena. Cavitation dynamics and mechanisms, detection and measurement, and acoustic studies are among the topics included. Applications include cavitating jets for rock drilling and cleaning, and marine engineering. Citations also include investigations of cavitation problems in power plant systems. Citations pertaining to turbines, propellers, rudders, cavities, hydrofoils, and cavitation erosion and corrosion are excluded.

NTIS

Cavitation Corrosion; Cavitation Flow; Cavities; Corrosion; Data Bases; Propellers; Rocks; Rudders; Turbines

19980009906 Ohio State Univ., Research Foundation, Columbus, OH USA

Recovery of Frozen Flow Losses in Arcjets Final Report

Subramaniam, V. V., Ohio State Univ., USA; Jun. 06, 1996; 21p; In English

Contract(s)/Grant(s): F49620-94-1-0015; AF Proj. 2308

Report No.(s): AD-A329728; AFOSR-TR-97-0398; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Our research is concerned with the development of high performance simulations of non-equilibrium flows in arcjets, with the specific aim of identifying and quantifying frozen flow loss mechanisms and channels. Further details of the research can be found in technical articles cited in this report, as well as in several forthcoming papers.

DTIC

Arc Jet Engines; Nonequilibrium Flow; Computerized Simulation

19980010119 Stanford Univ., Dept. of Mechanical Engineering, Stanford, CA USA

Turbulent Flow Control Final Report, 1 Nov. 1990 - 28 Feb. 1995

Reynolds, W. C., Stanford Univ., USA; May 24, 1995; 7p; In English

Contract(s)/Grant(s): AFOSR-0072-91

Report No.(s): AD-A329673; AFOSR-97-0493TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The primary purpose of this project was to explore actuators, sensors, and control strategies for active control of turbulent jets and boundary layers. Potential applications of this work are to boundary layer control in aircraft and propulsion systems, which should be enabled by concurrent developments in MEMS fabrication technology. The present experiments were performed in a low-speed water flow, where the turbulence is large scale and slow, allowing easy measurement of flow properties and use of actuators and sensors that could be fabricated individually. A zero net mass flow actuator was developed and used in conjunction with wall stress sensors to demonstrate control of laminar flows containing steady and unsteady streamwise vortices similar to those found in the near-wall region of turbulent boundary layers. Various closed loop control schemes, including an adaptive inverse

neural net control, were explored. An early phase of the project was devoted to extension of work on control of round jets by acoustic excitation. It was shown that the jet direction and mixing can be strongly influenced by acoustic and fluidic actuation.

DTIC

Boundary Layer Control; Boundary Layers; Feedback Control; Flow Characteristics; Laminar Flow; Active Control; Adaptive Control; Actuators; Turbulent Boundary Layer

19980010128 Institut National Polytechnique, Grenoble, France

Eleventh Symposium on Turbulent Shear Flows: Late Papers

Jan. 01, 1997; 19p; In English; 11th; Symposium on Turbulent Shear Flows, 8-10 Sep. 1997, Grenoble, France

Report No.(s): AD-A332357; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Eleventh symposium on turbulent shear flows late papers include: (1) Low dimensional description of large scale structures dynamics in a plane turbulent mixing layer; (2) Simulation of coherent structures in variable density coaxial jets; and (3) Amplification and reduction of turbulence in a heated jet/shock wave interaction.

DTIC

Conferences; Shear Properties; Turbulent Flow; Shear Flow

19980010334 NERAC, Inc., Tolland, CT USA

Fluid Leak Detection. (Latest Citations from the NTIS Bibliographic Database)

Feb. 1996; In English

Report No.(s): PB96-863378; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning equipment and applications of leak detection in fluid systems. Sensors, transducers, and methods of leak detection are addressed. The citations also discuss pressure, volume, and acoustic methods. Various industry applications of leak detection are investigated. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Leakage; Detection

19980010452 Massachusetts Univ., Dept. of Civil and Environmental Engineering, Lowell, MA USA

Behavior of Multiphase Granular Media: Modeling the Static-to-Viscous Flow Regime Final Report, 1 Jun. 1994 - 31 May 1997

Ting, John M., Massachusetts Univ., USA; Aug. 22, 1997; 2p; In English

Contract(s)/Grant(s): F49620-94-I-0320

Report No.(s): AD-A329959; AFOSR-97-0400TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

In the researched work, assemblages of nearly perfectly round photoelectric disks were subjected to confined compression, the sheared along an interface of varying roughness (very rough or very smooth). Overall, there was excellent comparison between the behavior observed in the physical system and the DEM simulations. Global response as measured by external wall forces, and individual particle kinematics were found to be in excellent agreement. Local contact forces and interactions were modeled generally well, but not as well as the global behavior.

DTIC

Kinematics; Simulation; Surface Roughness

19980010569 Technische Univ., Delft, Netherlands

Three-Dimensional Viscous Flow Patterns Near a Plane Wall

de Winkel, Marco Eric Marcel, Technische Univ., Netherlands; Jun. 17, 1996; 135p; In English

Report No.(s): PB97-154934; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Contents include the following: Introduction; Steady, viscous, incompressible flow; Hyperbolic singularities; Mathematical tools; Singularities of two-dimensional separated flow and three-dimensional separated flows; Non-hyperbolic singularities of local flow structures; The physical unfoldings of form two-dimensional separated flow and three dimensional separated flow; The physical unfoldings of form local flow structures; The linear transformation F for two-dimensional separated flow; and Summary.

NTIS

Separated Flow; Wall Flow; Computational Fluid Dynamics; Singularity (Mathematics); Boundary Layer Flow; Incompressible Flow

19980010750 San Jose State Univ., Dept. of Materials Engineering, CA USA

Effect of Temperature on Wetting Angle

Brindos, Richard, San Jose State Univ., USA; Selvaduray, Guna, San Jose State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 137-151; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The phenomenon of wetting is very important in many cases, both industrially and otherwise. One example of an industrial application where wetting plays a critical role is in the formation of brazed and soldered joints. The application of wax on automobile paint reduces the tendency of the paint to be wet by water. Similarly, in the kitchen nonstick frying pans have that name because they are not wet by water or oil. The topic is also of critical importance in the application of adhesives. Wetting can be explained using the following example. Immerse a solid in a liquid (e.g. a glass slide in water) and then remove it. If the liquid adheres to the solid as the piece is removed then the liquid is said to have wet the solid. On the other hand, if the liquid beads up into spherical balls and does not stick to the solid, then the liquid does not wet the solid. Another very common example of non-wetting is liquid mercury placed on glass; the liquid mercury will form small spheres and not stick to the surface. The wetting behavior of a liquid on a solid can be characterized by the wetting or contact angle that is formed between the liquid and the solid substrate. Contact angle studies are commonly done by using the Sessile Drop Method. A "sessile drop" is a continuous drop of liquid on a flat, solid surface under steady-state conditions. To neglect the effects of gravity, the gravitational forces should be small compared to the surface tension of the drop. If this condition is satisfied, the drop will approach a hemispherical shape which represents its smallest area and lowest surface free energy. The sessile drop is placed on the solid substrate and the angle between the solid surface and the tangent to the liquid surface at the contact point is measured. This is known as the contact angle or wetting angle. The contact angle can vary between 0 and 180 degree and is a measure of the extent of wetting. The conditions of good wetting are (Theta less than 90 degrees) and partial-wetting (Theta greater than 90 degrees). Complete wetting (also referred to as spreading) is obtained at an angle of 0 degrees and complete non-wetting occurs at an angle of 180 degrees.

Derived from text

Wetting; Temperature Effects; Interfacial Tension; Liquid Surfaces; Solid Surfaces; Liquid-Solid Interfaces

19980010752 NASA Langley Research Center, Hampton, VA USA

Transpiration Cooling Experiment

Song, Kyo D., Norfolk State Univ., USA; Ries, Heidi R., Norfolk State Univ., USA; Scotti, Stephen J., NASA Langley Research Center, USA; Choi, Sang H., NASA Langley Research Center, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 163-182; In English; Also announced as 19980010742

Contract(s)/Grant(s): NAG1-1513; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The transpiration cooling method was considered for a scram-jet engine to accommodate thermally the situation where a very high heat flux (200 Btu/sq. ft sec) from hydrogen fuel combustion process is imposed to the engine walls. In a scram-jet engine, a small portion of hydrogen fuel passes through the porous walls of the engine combustor to cool the engine walls and at the same time the rest passes along combustion chamber walls and is preheated. Such a regenerative system promises simultaneously cooling of engine combustor and preheating the cryogenic fuel. In the experiment, an optical heating method was used to provide a heat flux of 200 Btu/sq. ft sec to the cylindrical surface of a porous stainless steel specimen which carried helium gas. The cooling efficiencies by transpiration were studied for specimens with various porosity. The experiments of various test specimens under high heat flux have revealed a phenomenon that chokes the medium flow when passing through a porous structure. This research includes the analysis of the system and a scaling conversion study that interprets the results from helium into the case when hydrogen medium is used.

Author

Cooling; Heat Flux; Jet Engines; Fuel Combustion

19980010824 Department of the Navy, Washington, DC USA

Field Calibration of the Normal Pressure Transfer Function of a Compliant Fluid-Filled Cylinder

Peloquin, Mark S., Inventor, Department of the Navy, USA; May 29, 1997; 24p; In English

Patent Info.: US-Patent-Appl-SN-865150

Report No.(s): AD-D018617; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A method is presented to calibrate the transfer function for a fluid-filled compliant cylinder as a function of wavenumber and frequency. An air-filled compliant cylinder has a first linear array of force sensors coupled to the cylinder's exterior surface. A turbulent flow field is generated in a fluid environment about the first linear array which generates an output indicative of pressure incident thereupon. A fluid-filled compliant cylinder identical in diameter to the air-filled compliant cylinder houses a second linear array of force sensors. A similar turbulent flow field is generated in the fluid environment about the fluid-filled compliant

cylinder to generate an output indicative of pressure incident upon the second linear array. The ratio of outputs is indicative of the transfer function of the fluid-filled compliant cylinder. Each output can be further adjusted by a calibrated sensitivity of the corresponding first and second linear arrays. The method compensates for elastic scattered pressure fields and the wavenumber-frequency dependence of the air-filled compliant cylinder's sensitivity to pressure.

DTIC

Transfer Functions; Hydrostatic Pressure; Linear Arrays; Fluid Filled Shells

19980010843 Stanford Univ., Dept. of Mathematics, Stanford, CA USA

Nonlinear Waves in Mechanics and Gas Dynamics *Final Report, 1 Apr. 1994 - 31 Mar. 1997*

Liu, Tai-Ping, Stanford Univ., USA; Jun. 1997; 4p; In English

Contract(s)/Grant(s): DAAH04-94-G-0045

Report No.(s): AD-A332125; ARO-32376.12-MA; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The author has studied the qualitative behaviour of nonlinear waves for hyperbolic conservation laws with or without the effects of dissipations, discretization, or nonlinear resonance. The fundamental problem of well-posedness theory for hyperbolic conservation laws is being resolved. It is shown that no physical law, beyond the second law of thermodynamics, is needed. The shock waves for finite difference schemes are shown to have slow decaying tails due to the effect of small divisor. Physical degenerate dissipation matrix is shown to give rise to rich nonlinear wave phenomena. Nonlinear waves for non-strictly hyperbolic system are shown to behave sensitively as a functional of the dissipation matrix. The ideas of wave tracing and pointwise estimates introduced by the author play the central role in the analysis of these problems.

DTIC

Shock Waves; Conservation Laws; Finite Difference Theory

19980010857 Naval Postgraduate School, Monterey, CA USA

Uniform Flow Past a Rigid Sphere by the Spectral Numerical Methods

Akcan, Zekai, Naval Postgraduate School, USA; Mar. 1997; 63p; In English

Report No.(s): AD-A331455; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A steady, axially symmetric, incompressible, viscous flow past a rigid sphere is numerically simulated by using a numerical scheme, based on spectral methods. The equations have been reduced to two sets of nonlinear second order partial differential equations in terms of vorticity and stream function. The calculations have been carried out for Reynolds numbers, based on the sphere diameter, in the range 0.1 to 104. The numerical results have verified that there is excellent agreement with Stokes theory at very low Reynolds numbers. At moderate to intermediate Reynolds numbers there is good general agreement with available experimental data and flow visualization pictures. The Reynolds number at which separation occurs is estimated as 20. The approach to boundary-layer behavior with increasing Reynolds numbers is also verified by comparison with potential flow theory and analytical boundary-layer solution.

DTIC

Axisymmetric Flow; Boundary Layers; Estimating; Flow Theory; Flow Visualization; Incompressible Flow; Information Flow; Low Reynolds Number; Nonlinearity; Numerical Analysis

19980010865 Department of the Navy, Washington, DC USA

Optimizing the Compressional Wave Energy Response of an Elastic Fluid-Filled Cylinder

Peloquin, Mark S., Inventor, Department of the Navy, USA; May 29, 1997; 23p; In English

Patent Info.: US-Patent-Appl-SN-870263

Report No.(s): AD-D018618; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A method and system are provided to optimize filtering of congressional wave energy in the wavenumber domain for a given frequency range using a fluid-filled elastic cylinder. The fluid is selected based on its fluid density ρ_i and dilatational wave phase velocity c_i .

DTIC

Noise Reduction; Compression Waves; Towed Bodies; Elastic Cylinders; Fluid Filled Shells

19980010932 Yale Univ., New Haven, CT USA

Temperature, Trace Species, and Phase Conjugation in Droplets and Sprays *Final Report, 15 Jul. 1994 - 14 Jul 1994*

Chang, Richard K., Yale Univ., USA; Aug. 14, 1997; 9p; In English

Contract(s)/Grant(s): F49620-94-1-0360; AF Proj. 3484

Report No.(s): AD-A329726; AFOSR-TR-97-0402; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Liquid microdroplets play an important role in combustion as well as atmospheric chemistry. Characterizing droplets in terms of size, shape, chemical composition, temperature, etc., is essential for research in these two fields. Nonlinear optics has proven to be a useful diagnostic tool for determining these important characteristics. The research funded by this contract has resulted in the development of three new diagnostic techniques for characterizing microdroplets with mode locked laser pulses: (1) The temporal beating of adjacent, degeneracy split droplet cavity modes has been used to determine both the droplet distortion amplitude and the linewidths of the cavity resonances. (2) The localized, laser induced electrostrictive distortion induced by a train of mode locked laser pulses was shown to increase the input coupling to droplet cavity resonances for subsequent laser pulses and reduce the threshold for stimulated Raman scattering by almost two orders of magnitude. (3) Optical second harmonic generation has been used to both detect surfactant molecules adsorbed on droplet surfaces, as well as to determine the relative concentrations and molecular orientations of the surfactants.

DTIC

Adsorption; Atmospheric Chemistry; Nonlinear Optics; Phase Conjugation; Drops (Liquids); Sprayers; Combustion

19980010959 Naval Surface Warfare Center, Carderock Div., Bethesda, MD USA

Evaluation of the Mississippi State University Computational Fluid Dynamics Code (UNCLE) Final Report, Oct. 1995 - Sep. 1996

Busby, Judy A., Naval Surface Warfare Center, USA; Sep. 1996; 21p; In English

Report No.(s): AD-A331348; CRDKNSWC/HD-1318-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report documents efforts, to date, in the transition of the Mississippi State University (MSU), incompressible Reynolds-Averaged Navier-Stokes code (UNCLE). The code is evaluated through replication of previous cases documented by MSU and computation of new cases that include more realistic geometries. A grid-sensitivity study is performed, in which a series of grid types and grid distributions is examined. Comparisons of the computed results with measured data for two submarine hulls are presented.

DTIC

Computational Fluid Dynamics; Hulls (Structures); Incompressible Flow; Navier-Stokes Equation; Reynolds Averaging

19980010967 Department of the Navy, Washington, DC USA

Suppressing Cavitation in a Hydraulic Component

Ruffa, Anthony A., Inventor, Department of the Navy, USA; Feb. 26, 1997; 11p; In English

Patent Info.: US-Patent-Appl-SN-807128

Report No.(s): AD-D018600; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A method and apparatus are provided for suppressing flow-induced cavitation in a fluid flow. At least one acoustic transducer is coupled to the fluid flow in a region that is susceptible to the formation of cavitation bubbles. The transducer (or transducers) applies an acoustic field to the fluid flow in order to raise the cavitation threshold pressure of the fluid flow above the total local pressure including the pressure drop induced by the fluid flow and the pressure due to the acoustic field.

DTIC

Hydraulic Equipment; Fluid Flow; Cavitation Flow

19980011513 Boston Univ., Boston, MA USA

A Critical Assessment of the Smagorinsky Model and a New Approach to Large-Eddy Simulations

Speziale, Charles G., Boston Univ., USA; Dec. 1997; 21p; In English

Contract(s)/Grant(s): DAAG55-97-1-0123

Report No.(s): AD-A332772; TR-AM-97-033; ARO-36216.2-EG; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Smagorinsky model for the large-eddy simulation of turbulence is critically assessed from a basic theoretical standpoint. It is shown that this model does not respond properly to the coarsening of the mesh because of its incorrect dependence on the dimensional mesh size. Rather, it is the dimensionless ratio of the computational mesh size to the Kolmogorov length scale that determines how well resolved a computation is and should be used to parameterize subgrid scale models. Furthermore, the Smagorinsky model has no dependence on rotational strains and depends improperly on the irrotational strain rate invariants. These facts tend to explain why the Smagorinsky constant is not in reality a constant in applications. An entirely new methodology for large-eddy simulations that is suitable for complex geometries is proposed that eliminates these deficiencies. In this new approach to large-eddy simulations, subgrid scale models go continuously to Reynolds stress models in the coarse mesh/infinite Reynolds number limit.

DTIC

Large Eddy Simulation; Turbulence; Computerized Simulation; Scale Models; Stress Analysis

19980011515 Illinois Inst. of Tech., Chicago, IL USA

Smart Wall for Control of the Burst Cycle of Longitudinal Vortices in Turbulent Boundary Layers Final Report

Corke, T. C., Illinois Inst. of Tech., USA; Oct. 20, 1997; 66p; In English

Contract(s)/Grant(s): DAAH04-93-G-0212

Report No.(s): AD-A332775; TCC-1-97; ARO-32111.1-EG-SM; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This work was aimed at developing a 'smart wall' through the integration of an optical sensor pressure transducer array and an array of miniature magnetic actuators. The pressure transducer array corresponded to one mirror of an interferometer. This mirror was a thin, flexible sheet on which a reflective layer had been vapor deposited. The sheet overlaid an array of small closely spaced holes in the wall surface. The instantaneous pressure was determined over each hole by the spacing of Moire fringes. The fringe patterns over each hole were simultaneously acquired by a ccd-camera (viewing the full field) and frame-grabber connected to a host computer. The processing involved converting the fringe pattern to pressures, using a neural network, and performing spatial filtering to highlight features associated with longitudinal vortices (large streamwise wave lengths and short spanwise wave lengths). As a compliment to this, a 1-D array of hot wire sensors were acquired for the same flow conditions. 2-D space time analysis of the hot-wire data series were used to categorize the most effective actuator settings. These results were compared to those from the optical pressure sensor array. Bridging the two experiments was the development of software for 2-D Fourier, frequency/wave number analysis of the data series. The final part of the work was the development of a wall element which could introduce spanwise periodic distortions in the wall surface. This consisted of a flexible silicon sheet which covered narrow electromagnetic strips. The strips formed a 1-D array with a spanwise spacing which was suitable for the spanwise scale of streamwise vortices which formed in the flow. The strips deflected in response to a computer output which was designed to produce a standing pattern in the flow.

DTIC

Turbulent Boundary Layer; Vortices; Pressure Sensors; Interferometers; Mirrors; Actuators; Fourier Analysis

19980011521 NASA Lewis Research Center, Cleveland, OH USA

Measurements of Heat Transfer, Flow, and Pressures in a Simulated Turbine Blade Internal Cooling Passage

Russell, Louis M., NASA Lewis Research Center, USA; Thurman, Douglas R., Army Research Lab., USA; Poinsatte, Philip E., NASA Lewis Research Center, USA; Hippensteele, Steven A., NASA Lewis Research Center, USA; Dec. 1998; 26p; In English; Original contains color illustrations

Contract(s)/Grant(s): RTOP 505-62-52; DA Proj. 1L1-61102-AH-45

Report No.(s): NASA-TP-3646; E-10404; NAS 1.60:3646; ARL-TR-923; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experimental study was made to obtain quantitative information on heat transfer, flow, and pressure distribution in a branched duct test section that had several significant features of an internal cooling passage of a turbine blade. The objective of this study was to generate a set of experimental data that could be used for validation of computer codes that would be used to model internal cooling. Surface heat transfer coefficients and entrance flow conditions were measured at nominal entrance Reynolds numbers of 45,000, 335,000, and 726,000. Heat transfer data were obtained by using a steady-state technique in which an Inconel heater sheet is attached to the surface and coated with liquid crystals. Visual and quantitative flow-field data from particle image velocimetry measurements for a plane at midchannel height for a Reynolds number of 45,000 were also obtained. The flow was seeded with polystyrene particles and illuminated by a laser light sheet. Pressure distribution measurements were made both on the surface with discrete holes and in the flow field with a total pressure probe. The flow-field measurements yielded flow-field velocities at selected locations. A relatively new method, pressure sensitive paint, was also used to measure surface pressure distribution. The pressure paint data obtained at Reynolds numbers of 335,000 and 726,000 compared well with the more standard method of measuring pressures by using discrete holes.

Author

Flow Distribution; Pressure Distribution; Flow Visualization; Liquid Crystals; Ducts; Heat Transfer Coefficients; Reynolds Number

19980011575 Lehigh Univ., Dept. of Mechanical Engineering and Mechanics, Bethlehem, PA USA

Combined Theoretical and Experimental Study of Phenomena Related to Limit Cycle Oscillations Final Report, Jun. 1993 - May 1997

Walker, J. D., Lehigh Univ., USA; Smith, C. R., Lehigh Univ., USA; Delph, T., Lehigh Univ., USA; Oct. 13, 1997; 10p; In English Contract(s)/Grant(s): N00014-93-I-0324

Report No.(s): AD-A330174; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A combined theoretical, computational, and experimental program has investigated situations where fluid motion and a flexible surface produce nonlinear interactions. The main cases of interest concern situations where an external flow field contains a significant disturbance, such as a vortex in subsonic flow or a shock wave in supersonic flow. This type of flow feature can produce pressure perturbations which may provoke movement in flexible panels on the surface, as well as unsteady viscous separation effects in the boundary layers, which are on all solid walls. The net result is a complex interaction between the external mainstream flow, the viscous boundary layers, and the flexible surface itself. The aforementioned interactions produce complicated oscillations of the surface that are sometimes referred to as Limit Cycle Oscillations (LCO). When such events are observed, it is common for a significant flow disturbance, such as a shock wave or vortex, to be somewhere in the vicinity. The present research addresses a number of fundamental problems of LCO, with the goal of establishing cause and effect relationships in relatively simple environments. Several computational and experimental studies of selected simplified interactions are described in the body of the report.

DTIC

Subsonic Flow; Supersonic Flow; Mathematical Models; Data Acquisition; Oscillations; Perturbation

19980011614 Ohio State Univ., Dept. of Mechanical Engineering, Columbus, OH USA

A Study of High Speed Flows Using Advanced Optical Diagnostics Final Report, Jun. 1993 - May 1997

Samimy, M., Ohio State Univ., USA; Clancy, P. S., Ohio State Univ., USA; Jul. 1997; 42p; In English

Contract(s)/Grant(s): F49620-93-I-0418

Report No.(s): AD-A330606; MSME-97-101; AFOSR-TR-97-0538; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Over the past few years, we have been working on the development of advanced optical diagnostics to be used in high speed flows. Our focus has been on the techniques based on molecular absorption filters. The focus of this report is on the details of a two-component planar measurement that we call Planar Doppler Velocimetry (PDV) technique. A PDV technique was developed and used to measure two components of instantaneous velocity in an ideally expanded, Mach 2, free jet. The technique utilizes a molecular filter as a frequency discriminator and uses two cameras to resolve two components of velocity on a plane that is illuminated by a laser sheet. Careful formation of the laser sheet, proper calibration of the splitter/recombiner imaging system and precise image registration were found to be critical steps in the technique. The velocity measurements obtained with this technique were compared with reference LDV measurements taken in the same flowfield. The mean velocity results were in very good agreement with the reference measurements and the turbulence results captured only the correct trend. A detailed error analysis describes the error sources inherent in the PDV technique. For the current two-component PDV system the estimated uncertainty for the mean velocity was better than $\pm 5\%$. Methods to improve the technique are discussed.

DTIC

Diagnosis; High Speed; Flow Distribution; Images; Optical Activity

19980011672 Yale Univ. Observatory, New Haven, CT USA

Developing New Generation of Models for Turbulent Flows Final Report, 1 Mar. 1993 - 30 Jun. 1997

Sreenivasan, K. R., Yale Univ. Observatory, USA; Aug. 15, 1997; 10p; In English

Contract(s)/Grant(s): F49620-93-I-0171

Report No.(s): AD-A332885; AFOSR-97-0708TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of the study was to generate, from a simple set of rules, a stochastic signal in space-time that would closely resemble the real turbulent data. This goal has been achieved and the work is reported in a journal article (Phys. Rev. E. 49, 5179, 1994) and Chapter 4.4 of the Ph.D thesis by A. Juneja (May 1995). The paper explains the principles and deals with one dimensional signals whereas the thesis chapter deals with three dimensional signals. These synthetic signals possess most of the statistical properties of real turbulence, and have been used as initial conditions in a direct numerical simulation of homogeneous turbulence. A comparable scheme was attempted for wall bounded flows, and the principal hypothesis relating to this attempt was successfully verified in a high-Reynolds-number turbulent pipe flow and a moderate-Reynolds-number turbulent boundary layer.

DTIC

Direct Numerical Simulation; High Reynolds Number; Homogeneous Turbulence; Turbulent Boundary Layer; Turbulent Flow; Wall Flow; Turbulence

19980011680 Army Research Lab., Adelphi, MD USA

An Experimental Examination of the Streamwise Velocity in a Plane Mixing Layer using a Single Hot-Wire Sensor Final Report, 10 Oct. 1995 - 15 Mar. 1996

Loucks, Richard B., Army Research Lab., USA; Sep. 1997; 35p; In English

Report No.(s): AD-A332948; ARL-TR-1391; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A single-sensor hot-wire probe was used to make streamwise measurements in a turbulent plane mixing layer. The mixing layer, with a velocity ratio of approximately 2:1, was created in an open return wind tunnel by the insertion of a curved splitter plate. Conditions were studied with the splitter plate boundary layers tripped. The single-sensor results demonstrate that this mixing layer has standard velocity field statistical properties. The data were taken at several Reynolds numbers in the fully turbulent flow downstream of the mixing point. The results from the tripped initial boundary layers/fully turbulent conditions were compared with the temporally developing mixing layer direct numerical simulation results of Rogers and Moser (1994).

DTIC

Mixing Layers (Fluids); Velocity Distribution; Turbulent Flow; Reynolds Number; Wind Tunnel Tests; Turbulent Mixing

19980011697 Army Research Lab., Aberdeen Proving Ground, MD USA

Fluid Dynamics Assessments of Deposition and Infiltration Models *Final Report, Jun. 1996 - Mar. 1997*

Soln, Josip Z., Army Research Lab., USA; Oct. 1997; 40p; In English

Report No.(s): AD-A332747; ARL-TR-1525; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The fluid dynamics assessments of deposition and infiltration models, such as the chemical-agent deposition analysis for rotorcraft surfaces (CADARS) and the aerosol and vapor infiltration analysis (AVIA) models, are carried out. Although these models address different needs of the Army and deal with enclosures surrounded by a toxic environment, we believe that there are enough similarities between them to be given the same type of fluid dynamics analysis.

DTIC

Fluid Dynamics; Chemical Analysis; Deposition; Infiltration; Rotary Wing Aircraft; Aerosols

19980011979 Helsinki Univ. of Technology, Espoo, Finland

Simulation of Viscous Flow in a Centrifugal Compressor

Pitkaenen, H., Helsinki Univ. of Technology, Finland; Siikonen, T., Helsinki Univ. of Technology, Finland; Sep. 11, 1995; 46p; In English

Report No.(s): PB96-169701; SER-B-46; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A numerical simulation of a steady three-dimensional viscous flow in a centrifugal compressor is described. The simulation is based on a solution of thin-layer Navier-Stokes equations, which are solved using an implicit time integration method with a multigrid acceleration of convergence. The effects of turbulence are evaluated employing an algebraic turbulence model. Simulations are performed for the Krain impeller at three different inlet mass flows, and for a high-speed compressor at design conditions.

NTIS

Centrifugal Compressors; Viscous Flow; Computational Fluid Dynamics; Three Dimensional Flow; Steady Flow; Navier-Stokes Equation; Mathematical Models; Turbulence Effects; Simulation

19980012006 Helsinki Univ. of Technology, Espoo, Finland

Numerical Method for Simulating Unsteady Flow Including Solid/Fluid Interaction

Hoffren, J., Helsinki Univ. of Technology, Finland; Sep. 27, 1995; 40p; In English

Report No.(s): PB96-169495; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new thin-layer Navier-Stokes solver for time-dependent compressible flows has been developed. The implicit, temporally second-order accurate formulation facilitates the simulation of flows at high Reynolds numbers. The effects of turbulence can be taken into account by applying algebraic or two-equation turbulence models. Complex, arbitrarily deforming geometries can be handled using fully conservative multi-block structured grids. An iterative time-stepping utilizing a multigrid technique maintains the temporal and spatial accuracy of the basic scheme also at grid block interfaces and solid boundaries. The flow solver has been coupled with an interactive time integration of the structural deformations of the geometry under study. The explicit second-order accurate scheme enables an easy and efficient treatment of the structural model, where non-linearities can be handled in a straightforward manner.

NTIS

High Reynolds Number; Unsteady Flow; Compressible Flow; Navier-Stokes Equation; Fluid Dynamics; Turbulence Effects; Time Dependence

INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography. For aerial photography see 43 Earth Resources and Remote Sensing. For related information see also 06 Aircraft Instrumentation, and 19 Space Instrumentation.

19980009147 NERAC, Inc., Tolland, CT USA

Biosensors and Bioelectrodes. (Latest Citations from Conference Papers Index)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865258; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the manufacture and industrial applications of biosensors and bioelectrodes. Topics include implantable biosensors, failure analysis of bioelectrodes, biocompatibility and toxicology of implanted biosensors, fiber optic-based biosensors, enzyme-based biosensors, silicon-based biosensors, and manufacturing technology. Medical use of biosensors including analysis of glucose, oxygen, and pH is described. Biosensors signal processing technology is also examined.

NTIS

Bibliographies; Bioelectricity; Bioinstrumentation; Biophysics; Failure Analysis

19980009219 NERAC, Inc., Tolland, CT USA

Proximity Sensors. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865266; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning various types of proximity sensors. A variety of sensors is examined, including optical, electric, magnetic, ultrasonic, and air-jet. These devices enable precise measurement, control, and monitoring of process quantities. The citations also discuss industrial applications. The design of linear and digital hall-effect proximity sensors is presented.

NTIS

Bibliographies; Distance Measuring Equipment; Proximity Effect (Electricity); Examination

19980009236 NERAC, Inc., Tolland, CT USA

Load Cells. (Latest Citations from the Ei Compendex*Plus Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-858824; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of strain gauges to evaluate dynamic stress factors on a variety of materials. Citations include the effects of positioning and augmentation used to determine fracture parameters. Articles also discuss calibration methods and performance factors.

NTIS

Bibliographies; Stress Analysis; Loads (Forces); Data Bases

19980009246 NERAC, Inc., Tolland, CT USA

Laser Gyroscopes (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-869102; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, technology, and engineering of laser gyroscopes. Ring laser quantum statistical theory, technology assessment, backscattering ramifications, optical gyroscopes compared and contrasted with the laser interferometric system, and fiber ring optical gyroscope technologies are among the subjects discussed. Performance evaluations of operational hardware are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Laser Gyroscopes

19980009539 NERAC, Inc., Tolland, CT USA

Pressure Sensing Devices: Federal Applied Technologies Available for Licensing. (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866553; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning selected patents and patent applications of federal applied technologies available for licensing in the area of pressure sensing devices. Equipment for soil pressure measurement, gas pressure, solid state sensors, pressure transducers, and pressure warning systems is presented. Calibration systems are also discussed. Applications include blood pressure measurements, fuel tank monitoring, bioengineering, differential pressure change alarms, measuring probes, switches, regulators, and fluid flow measurements. Patents on blood pressure sensors and silicon pressure sensors are examined in separate published bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Pressure Sensors; Pressure Measurement

19980009640 NERAC, Inc., Tolland, CT USA

Calibration of Hot Wire Anemometers. (Latest Citations from the Aerospace Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865282; NASA/TM-96-206739; NAS 1.15:206739; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning calibration methods and measurement correction schemes for hot wire anemometers. Coverage includes static and dynamic calibration of sensors having single, multiple, cross, and ring wire configurations. Correction methods to account for yaw angle, low-velocity flow, microgravity, wall proximity, and highly fluctuating turbulence, velocity, or temperature are covered. Correction methods are also referenced for installations having multiple sensors. Hot film and laser anemometers, and the use of anemometers in specific industrial and aerospace applications are extensively covered in separate bibliographies. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Hot-Wire Anemometers; Calibrating; Bibliographies

19980009725 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Proceedings of the Workshop on the Scientific Applications of Clocks in Space Final Report

Maleki, Lute, Editor, Jet Propulsion Lab., California Inst. of Tech., USA; Aug. 01, 1997; 267p; In English; Workshop on the Scientific Applications of Clocks in Space, 7-8 Nov. 1997, Pasadena, CA, USA; Also announced as 19980009726 through 19980009750

Report No.(s): NASA/CR-97-112594; NAS 1.26:112594; JPL-Publ-97-15; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The Workshop on Scientific Applications of Clocks in space was held to bring together scientists and technologists interested in applications of ultrastable clocks for test of fundamental theories, and for other science investigations. Time and frequency are the most precisely determined of all physical parameters, and thus are the required tools for performing the most sensitive tests of physical theories. Space affords the opportunity to make measurement, parameters inaccessible on Earth, and enables some of the most original and sensitive tests of fundamental theories. In the past few years, new developments in clock technologies have pointed to the opportunity for flying ultrastable clocks in support of science investigations of space missions. This development coincides with the new NASA paradigm for space flights, which relies on frequent, low-cost missions in place of the traditional infrequent and high-cost missions. The heightened interest in clocks in space is further advanced by new theoretical developments in various fields. For example, recent developments in certain Grand Unified Theory formalisms have vastly increased interest in fundamental tests of gravitation physics with clocks. The workshop included sessions on all related science including relativity and gravitational physics, cosmology, orbital dynamics, radio science, geodynamics, and GPS science and others, as well as a session on advanced clock technology.

Author

Conferences; Space Missions; Gravitational Effects; Grand Unified Theory; Global Positioning System; Geodynamics

19980009726 Northwest Analysis, Bozeman, MT USA

Physical Law and Precision Clocks

Nordtvedt, Kenneth, Northwest Analysis, USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space;

Aug. 01, 1997, pp. 3-12; In English; Also announced as 19980009725

Contract(s)/Grant(s): NASw-4840; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The effects of proximate matter on the rates of clocks-as-physical-devices are discussed in terms of both underlying physical law and the Equivalence Principle. Three distinct types of clocks - oscillator, ruler and decay - are identified, though oscillator clocks are particularly discussed. Attention is given to the comparison between clock experiments and free-fall experiments as methods for searching for existence of new long range interactions. Clock experiments conducted close to the Sun would be competitive with today's free-fall experiments in probing physical law.

Author

Clocks; Equivalence; Theoretical Physics

19980009733 Stanford Univ., W. W. Hansen Experimental Physics Lab., Stanford, CA USA

The Superconducting Cavity Stabilized Oscillator

Turneaure, J. P., Stanford Univ., USA; Buchman, Saps, Stanford Univ., USA; Lipa, John, Stanford Univ., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 59-65; In English; Also announced as 19980009725

Contract(s)/Grant(s): NAS8-39225; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Superconducting Cavity Stabilized Oscillators (SCSOs) have produced the most stable clocks to date for integration times between $10(\exp 2)$ and $10(\exp 3)$ seconds, achieving a fractional frequency stability of $2 \times 10(\exp -16)$ for a sampling time of 100 s. The principal contributors to cavity frequency variations are: (1) acceleration effects due to gravity and vibrations; (2) temperature variations; (3) variations in the energy stored in the cavity; and (4) noise introduced by the frequency stabilization circuit. We discuss the prospects for improvements in all these areas for both ground-based and space-based SCSOs, which may lead to SCSOs with fractional frequency stabilities below $10(\exp -17)$. SCSOs of this frequency stability will be useful for testing fundamental physical principles.

Author

Superconductivity; Cavities; Oscillators; Frequency Stability

19980009734 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Space Experiments with High Stability Clocks

Vessot, Robert F. C., Smithsonian Astrophysical Observatory, USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 67-92; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

One of the most significant scientific improvements in our era is the unparalleled precision of measurement made possible by atomic clocks. The meter, the SI unit of length, is now defined in terms of the velocity of light, a pivotal quantity in our present Relativistic concepts of space and time. This discussion is meant to provide a picture of where we stand in the present state of docks, of techniques for clock-related space experiments, and of some now technically feasible space experiments.

Author

Spaceborne Experiments; Atomic Clocks; Time; Technologies

19980009736 University of Western Australia, Dept. of Physics, Nedlands, Australia

Ultrastable and Ultralow Phase Noise Microwave Sapphire Oscillators

Blair, D. G., University of Western Australia, Australia; Chang, S., University of Western Australia, Australia; Ivanov, E. N., University of Western Australia, Australia; Luiten, A. N., University of Western Australia, Australia; Mann, A. G., University of Western Australia, Australia; Tobar, M., University of Western Australia, Australia; Woode, R., University of Western Australia, Australia; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 101-125; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

At the University of Western Australia we have a broad program exploiting the properties of artificial sapphire in oscillators, transducers, optics, laser stabilization and mechanical test masses for precision experiments. Here we report progress in the development of both both high stability and low phase noise microwave oscillators. We have continued to develop 12 GHz oscillators based on a whispering gallery modes of 5 cm diameter sapphire resonators operated at 5-6 K. The latest resonator has been tested inside a gold-plated copper shield. It has a frequency-turning point at 5.3 K and unloaded Q of $2 \times 10(\exp 9)$. The loop oscillator frequency is locked to the resonator by active Pound stabilization and a second servo which removes amplitude modulation. The resonator temperature and incident microwave power are also servo controlled. The best oscillator stability achieved so far is characterized by an Allan standard deviation of about $2.5 \times 10(\exp -15)$ (τ)($\exp -1/2$) from 0.3 to 30 seconds, limited by the measurement system and servo system noise floors. At about 50 s the Allan deviation reaches a minimum of $8 \times 10(\exp -16)$. This represents

frequency stabilization to better than 1 ppm of the resonator bandwidth. Up to 100 seconds the stability degrades as approximately 1 to $2 \times 10^{(\exp -16)} (\tau)^{(\exp 1/2)}$. This medium term drift appears to be associated with mechanical instability of the resonator. Provided this problem can be solved there is scope, using high modulation index phase modulators, for achieving an Allan deviation of few times $10^{-16} (\tau)^{(\exp -1/2)}$ in the near future. We also report advances in low-noise microwave oscillator technology. We developed a new type of phase noise suppression technique based on the Ivanov-Tobar-Woode (ITW) phase detector. This detector is several orders of magnitude more sensitive than the conventional phase detector. At room temperature we have shown that the ITW detector can suppress the noise of a free running oscillator by at least 50 dB, whereas the conventional detector only supplies at most 25 dB suppression. A room temperature oscillator constructed using this technique exhibits a phase noise of -150 dBc/Hz @ 1 kHz offset. A liquid nitrogen temperature oscillator with a Q of $5 \times 10^{(\exp 7)}$ exhibits a phase noise of -165 dBc/Hz @ 1 kHz offset from a 9 GHz carrier using a conventional phase noise suppression technique. This is over 20 dB better than any other cryogenically cooled oscillator. By incorporating a liquid nitrogen cooled ITW detector into the oscillator, we have shown that a phase noise of order -185 dBc/Hz @ 1 kHz can be achieved. In the future we expect to achieve very high performance in an oscillator suitable for passive radiatively cooled space operation. This will use temperature compensation at 50 K to achieve ultralow phase noise and ultrahigh stability comparable to the present generation of cryogenic oscillators in a small package suitable for space clock missions.

Author

Noise Reduction; Microwave Oscillators; Sapphire; Frequency Stability; Amplitude Modulation

19980009737 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Cryo-Cooled Sapphire Oscillator for the Cassini Ka-Band Experiment

Wang, Rabi T., Jet Propulsion Lab., California Inst. of Tech., USA; Dick, G. John, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 127-129; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

We present features for an ultra-stable sapphire cryogenic oscillator which has been designed to support the Cassini Ka-band Radio Science experiment. The design of this standard is new in several respects. It is cooled by a commercial cryocooler instead of liquid cryogenics to increase operating time, and it uses a technology to adjust the temperature turn-over point to extend the upper operating temperature limit and to enable construction of multiple units with uniform operating characteristics. Objectives are $3 \times 10^{(\exp -15)}$ stability for measuring times 1 second less than or equal to (τ) less than or equal to 100 seconds, phase noise of -85 dBc/Hz from offset frequencies of 1 Hz to 1000 Hz at 10 GHz carrier frequency, and a one year continuous operating period.

Author

Cryogenics; Oscillators; Sapphire; Spaceborne Experiments

19980009738 National Inst. of Standards and Technology, Time and Frequency Div., Boulder, CO USA

High-Accuracy Hg(+) Microwave and Optical Frequency Standards in Cryogenic Linear Ion Traps

Berkeland, D. J., National Inst. of Standards and Technology, USA; Miller, J. D., National Inst. of Standards and Technology, USA; Cruz, F. C., National Inst. of Standards and Technology, USA; Bergquist, J. C., National Inst. of Standards and Technology, USA; Itano, W. M., National Inst. of Standards and Technology, USA; Wineland, D. J., National Inst. of Standards and Technology, USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 133-142; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We discuss time and frequency standards based on laser-cooled Hg(+)-199 ions confined in a cryogenic linear rf trap. In one experiment, a 40.5 GHz source, referenced to a hydrogen maser, is servoed to the ions' ground state hyperfine transition. The stability of this clock is better than $10^{(\exp -14)}$ using 100 s Ramsey periods, and its measured accuracy is around $10^{(\exp -13)}$. In a second experiment under development, a strong-binding cryogenic trap will confine a single ion used for an optical frequency standard based on the narrow S approaches D quadrupole transition at 282 nm. The cooling laser at 194 nm and the probe laser at 282 nm are being converted to compact, efficient, solid-state systems.

Author

Accuracy; Hydrogen Ions; Microwave Frequencies; Optical Properties

19980009739 Commonwealth Scientific and Industrial Research Organization, National Measurement Lab., Sydney, Australia

Progress on the CSIRO Trapped Ytterbium Ion Clocks

Fisk, Peter T. H., Commonwealth Scientific and Industrial Research Organization, Australia; Lawn, Malcolm A., Commonwealth Scientific and Industrial Research Organization, Australia; Coles, Colin, Commonwealth Scientific and Industrial Research Organization, Australia; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 143-152; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We have previously reported some aspects of the performance of a prototype frequency standard (IT-1) based on the 12.6 GHz ground state hyperfine 'clock' transition in Yb(+)-171 ions confined in a linear Paul trap. More recently, we have constructed a second prototype standard (IT-2), similar to IT-1 but with significant improvements in magnetic shielding and optical detection efficiency. A comparison of the measured clock transition frequencies of the two traps under conditions where they contain different numbers of ions, and consequently ion clouds of different sizes, provided an early test of a model which gives values for the differing second-order Doppler shifts in the two traps. In this paper we summarize some further results of comparisons between the two trapped ion frequency standards.

Author

Trapped Particles; Ytterbium; Clocks; Ions

19980009740 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Ion-Atom Cold Collisions and Atomic Clocks

Prestage, John D., Jet Propulsion Lab., California Inst. of Tech., USA; Maleki, Lute, Jet Propulsion Lab., California Inst. of Tech., USA; Tjoelker, Robert L., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 153-161; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Collisions between ultracold neutral atoms have for some time been the subject of investigation, initially with hydrogen and more recently with laser cooled alkali atoms. Advances in laser cooling and trapping of neutral atoms in a Magneto-Optic Trap (MOT) have made cold atoms available as the starting point for many laser cooled atomic physics investigations. The most spectacularly successful of these, the observation of Bose-Einstein Condensation (BEC) in a dilute ultra-cold spin polarized atomic vapor, has accelerated the study of cold collisions. Experimental and theoretical studies of BEC and the long range interaction between cold alkali atoms is at the boundary of atomic and low temperature physics. Such studies have been difficult and would not have been possible without the development and advancement of laser cooling and trapping of neutral atoms. By contrast, ion-atom interactions at low temperature, also very difficult to study prior to modern day laser cooling, have remained largely unexplored. But now, many laboratories worldwide have almost routine access to cold neutral atoms. The combined technologies of ion trapping, together with laser cooling of neutrals has made these studies experimentally feasible and several very important, novel applications might come out of such investigations. This paper is an investigation of ion-atom interactions in the cold and ultra-cold temperature regime. Some of the collisional ion-atom interactions present at room temperature are very much reduced in the low temperature regime. Reaction rates for charge transfer between unlike atoms, $A + B(+) \rightarrow A(+) + B$, are expected to fall rapidly with temperature, approximately as $T^{5/2}$. Thus, cold mixtures of atoms and ions are expected to coexist for very long times, unlike room temperature mixtures of the same ion-atom combination. Thus, it seems feasible to cool ions via collisions with laser cooled atoms. Many of the conventional collisional interactions, exploited as a useful tool at room temperature and higher, are greatly enhanced at low energy. For example, collisional spin transfer from one species of polarized atoms to another has long been a useful method for polarizing a sample of atoms where no other means was available. Because optical pumping cannot be used to polarize the nuclear spin of Xe-129 or He-3 (for use in nmr imaging of the lungs), the nuclear spins are polarized via collisions with an optically pumped Rb vapor in a cell containing both gases. In another case, a spin polarized thermal Cs beam was used to polarize the hyperfine states of trapped He(+)-3 ions in order to measure their hyperfine clock transition frequency. The absence of an x-ray light source to optically pump the ground state of the He(+)-3 ion necessitated this alternative state preparation. Similarly, Cd(+) and Sr(+) ions were spin-oriented via collisions in a cell with optically pumped Rb vapor. Resonant RF spin changing transitions in the ground state of the ions were detected by changes in the Rb resonance light absorption. Because cold collision spin exchange rates scale with temperature as $T^{-1/2}$ this technique is expected to be a far more powerful tool than the room temperature counterpart. This factor of 100 or more enhancement in spin exchange reaction rates at low temperatures is the basis for a novel trapped ion clock where laser cooled neutrals will cool, state select and monitor the ion clock transition. The advantage over conventional direct laser cooling of trapped ions is that the very expensive and cumbersome UV laser light sources, required to excite the ionic cooling transition, are effectively replaced by simple diode lasers.

Author

Ion Atom Interactions; Atomic Clocks; Collision Rates; Cooling; Trapped Particles

19980009741 Ecole Normale Supérieure, Lab. Kastler Brossel, Paris, France

PHARAO: A Space Clock with Cold Cesium Atoms

Salomon, C., Ecole Normale Supérieure, France; Lemonde, P., Ecole Normale Supérieure, France; Laurent, P., Observatoire de Paris, France; Simon, E., Observatoire de Paris, France; Santarelli, G., Observatoire de Paris, France; Clairon, A., Observatoire de Paris, France; Petit, P., Paris-Sud Univ., France; Dimarcq, N., Paris-Sud Univ., France; Audoin, C., Paris-Sud Univ., France;

Gonzalez, F., Centre National d'Etudes Spatiales, France; Changeart, F. Jamin, Centre National d'Etudes Spatiales, France; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 163-169; In English; Also announced as 19980009725; Sponsored in part by Ile de France; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We describe a cold atom clock designed for operating in micro-gravity, the PHARAO project. Preliminary results have already been obtained on Earth and the prototype will be tested in the reduced gravity of aircraft parabolic flights in the beginning of 1997. The PHARAO prototype is an extension of the work done at the BNM-LPTF on a cesium atomic fountain, which presents a resonance linewidth of 700 milliHertz, a frequency stability of $1.5 \times 10(\exp -13)(\tau)(\exp -1/2)$ where (τ) is the integration time in seconds. The accuracy of the fountain clock is presently $2 \times 10(\exp -15)$, more than three times better than previously achieved with uncooled conventional devices. The expected relative stability of the PHARAO cesium clock in space is about $3 \times 10(\exp -14)$ at one second or $10(\exp -16)$ day. Because the reduced gravity environment allows a mode of operation of the clock different from Earth fountains, the accuracy of PHARAO should surpass that of fountains and be in the $10(\exp -17)$ range. The PHARAO frequency standard could be a key element in future space missions in fundamental physics such as Solar Orbit Relativity Test (SORT), detection of gravitational waves, or for the realization of a global time scale and a new generation of positioning system.

Author

Clocks; Cesium; Design Analysis; Space Missions; Stability; Frequency Stability

19980009743 Yale Univ., Sloane Physics Lab., New Haven, CT USA

Future Laser-Cooled Microwave Clock Performance

Gibble, Kurt, Yale Univ., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 179-184; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Limitations to the performance of laser-cooled earth and space-based Cs clocks will be critically discussed. The most significant limitation to the stability and accuracy of laser-cooled atomic clocks is the frequency shift due to cold collisions. Because of it, laser-cooled Cs clocks must be operated at low density and this implies that space based Cs clock performance will not be significantly better than earth based. To regain some of the high accuracy and stability lost to the low density, clocks can be designed to multiply launch (or juggle) atoms. Clocks based on other atoms, in particular Rb-87 or possibly Rb-85, may have much smaller cold collision frequency shifts and therefore be capable of higher stability and accuracy, especially in a space environment.

Author

Lasers; Cooling; Microwaves; Atomic Clocks

19980009744 Stanford Univ., Dept. of Physics, Stanford, CA USA

Rotation Sensing with an Atom Interferometer Gyroscope

Gustavson, T. L., Stanford Univ., USA; Bouyer, P., Institut d'Optique, France; Kasevich, M. A., Stanford Univ., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 185-192; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We have recently demonstrated an atom interferometer gyroscope with a short-term sensitivity of $2 \times 10(\exp -8)$ rad/sec/square root of Hz. This performance is comparable with state-of-the-art optical gyroscopes. We have used this gyroscope to measure the rotation rate of the Earth. Straight forward improvements could bring this sensitivity to better than $10(\exp -9)$ rad/sec/square root of Hz and dramatically reduce long term drift.

Author

Rotation; Sensitivity; Optical Gyroscopes

19980009746 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

A Xylophone Detector of Gravitational Radiation

Tinto, Massimo, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 201-208; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

We discuss spacecraft Doppler tracking searches for gravitational waves in which Doppler data recorded on the ground are linearly combined with Doppler measurements made on board a spacecraft. By using the four-link radio system first proposed by Vessot and Levine, we describe a new method for removing from the combined data the frequency fluctuations due to the Earth troposphere, ionosphere, and mechanical vibrations of the antenna on the ground. This technique provides also a way for reducing by several orders of magnitude, at selected Fourier components, the frequency fluctuations due to other noise sources, such as the clock on board the spacecraft or the antenna and buffeting of the probe by nongravitational forces. In this respect spacecraft Doppler tracking can be regarded as a xylophone detector of gravitational radiation. In the assumption of calibrating the frequency

fluctuations induced by the interplanetary plasma, a strain sensitivity equal to 4.7×10^{-18} at 10^{-3} Hz is estimated. This experimental technique could be extended to other tests of the theory of relativity, and to radio science experiments that rely on high-precision Doppler measurements.

Author

Detectors; Gravitational Waves; Doppler Effect; Data Acquisition

19980009747 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Clock Requirements for Gamma-Ray Burst Localization Experiments

VanBuren, Dave, Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 209-210; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Precise localization of gamma-ray bursts requires accurate timing information. A feasible space experiment places a number of detectors in the inner solar system with AU separations. to attain arcsecond positions, clock accuracy must be held to 1 millisecond. Mission costs are significantly reduced if the clock drift can be held to 1 millisecond over the entire mission, i.e. for several years.

Author

Gamma Rays; Clocks; Position (Location)

19980009749 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Limits to the Stability of Phase Transfer from Ground to Space

Linfield, Roger P., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 221-224; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

An alternative to having a primary frequency standard on board a spacecraft is to phase lock a simple oscillator on the spacecraft to a microwave tone transmitted from the ground. The received tone is transponded and rebroadcast to the ground. The round trip phase is measured, and used to correct for effects on time scales longer than the round trip light travel time. This method is used with the TDRSS relay satellites, and will be used for the Japanese space VLBI mission VSOP. There are several sources of error introduced by this process. The most important error source is a loss of the on board standard for all times that the satellite is out of contact with a ground tracking station. The fractional loss will be greater than 10% for almost any orbit, even with a network of several ground tracking stations, and it will be considerably worse for a low earth orbit. Only a geostationary orbit can eliminate this problem. Another error source is connected to the previous one. Round trip phase tracking can remove, after the fact, link effects during a tracking pass on time scales greater than the round trip light travel time. However, there will be a jump in the spacecraft clock when multiple passes are connected (e.g. when the spacecraft is reacquired after passing out of sight). These jumps will be equal in magnitude (except for a geometrical factor) to the accuracy with which the spacecraft orbit is known. With a GPS receiver and GPS-like beacon on a spacecraft, the orbit can be known to a few cm, giving timing jumps on the order of 100 picoseconds. Even with a geostationary orbit, these jumps would occur any time the link was interrupted due to mechanical or electrical problems.

Author

Stability; Phase Transformations; Transmitters; Space Missions; Tracking Stations; Clocks

19980009831 NERAC, Inc., Tolland, CT USA

Infrared Cameras: Latest Citations from the INSPEC Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862693; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning applications of infrared cameras. Uses in telescoping, calorimetric measurements, deformation studies, thermal-wave phenomena, and temperature measurements are described. Also referenced is use to image the heating effect of radio frequency applicators. The application in accelerated environmental stress screening and reliability growth testing of the B-52 infrared camera is also considered.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Cameras; Bibliographies; Infrared Radiation

19980009895 NERAC, Inc., Tolland, CT USA

Magnetoresistive Recording Heads (Latest Citations from the INSPEC Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-856901; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning magnetoresistive (MR) recording head technology and applications in magnetic disk and tape storage devices. Topics include materials, characteristics, and key parameters. Design models and simulation methods are included. Signal processing techniques are described. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Recording Heads; Magnetoresistivity

19980009984 Naval Research Lab., Mechanics of Materials Branch, Washington, DC USA

Composite Piezoelectric Assemblies for Torsional Actuators Progress Report, Jun. 1996 - Jul. 1997

Kim, Chulho, Naval Research Lab., USA; Jessen, Todd, Naval Research Lab., USA; deGiorgi, Virginia, Naval Research Lab., USA; Bender, Barry, Naval Research Lab., USA; Wu, Carl C., Naval Research Lab., USA; Sep. 30, 1997; 60p; In English

Contract(s)/Grant(s): DARPA Order-D752

Report No.(s): AD-A331907; NRL/MR/6380--97-7997; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A new piezoelectric actuator was developed for the direct production of large angular displacement and torque, with a monolithic, solid state device. The intended application of this device is to control vibration and noise in aircraft, helicopter, spacecraft and in manipulators and positioners where direct rotary motion is required. Actuator design and assembly methods, materials preparation, poling procedures, and test results for joint strengths, and actuator output capabilities are discussed.

DTIC

Solid State Devices; Piezoelectricity; Actuators; Product Development

19980010122 Delaware Univ., Dept. of Electrical and Computer Engineering, Newark, DE USA

Microfabricating a NANOSCILLOSCOPE: Probing Local Device Fields Using AC Scanning Force Microscopy Interim Report, 1 May - 31 Aug. 1996

vanderWeide, D. W., Delaware Univ., USA; Nauzil, P., Delaware Univ., USA; Agrawal, V., Delaware Univ., USA; Oct. 25, 1997; 5p; In English

Contract(s)/Grant(s): N00014-96-I-0862

Report No.(s): AD-A330666; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Several ground-breaking results were achieved during the past year: The first combined scanning force/electric field probes were fabricated, tested and published. These results showed unprecedented spatial and temporal resolution of approximately 100 nm and 10 ps, respectively, when they were used to measure ultrafast electronic circuits. The approach taken was to modify commercial scanning probe microscope (SPM) probe tips with coaxial shields, then connect them directly to a 50 GHz sampling oscilloscope, a considerable simplification over laser-based systems for probing integrated circuits, yet much more flexible than commercial needle probes. This work has generated significant interest in the industry, and tech-transfer activities and discussions are ongoing with a number of companies, since, for the first time, it is possible to simultaneously locate sub-micrometer features (using the SPM feature to see sample topography) and electrically probe these features. Another significant accomplishment was the design, development and publication of the first combined high frequency magnetic field and topography probe tip. This invention was used to probe a coplanar waveguide sample at 10 GHz, mapping out the normal component of the magnetic field together with sample topography for the first time. This probe could prove especially useful in understanding new superconducting logic elements.

DTIC

Alternating Current; Electric Fields; Electromagnetic Fields; Field Theory (Physics); High Frequencies; Integrated Circuits; Lasers; Logical Elements; Magnetic Fields

19980010439 NERAC, Inc., Tolland, CT USA

Sensors and Probes in Heat Treating: Latest Citations from METADEX

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863089; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the measurement and control of process parameters during the heat treatment of metals. Citations present numerous types of sensing devices used to measure and control the temperature and atmosphere. Specific techniques and instrumentation described include optical pyrometers, oxygen and pressure sensors, radiation thermometry, interferometric sensors, and temperature probes. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Heat Treatment; Metals; Measuring Instruments

19980010556 NERAC, Inc., Tolland, CT USA

Holographic Storage Technology (Latest Citations from the INSPEC Database)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-862933; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of optical memory technology for storing holographic data. Data coding, formatting, and compression issues are discussed. Key elements of a holographic memory system, such as the storage media and optical read/write head, are described. Theoretical and practical storage capacity limits are also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Holography; Optical Memory (Data Storage)

19980010571 NERAC, Inc., Tolland, CT USA

Photogrammetry: Equipment and Image Processing. (Latest Citations from the INSPEC Database)

Mar. 1996; In English

Report No.(s): PB96-866298; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning aerial and satellite photogrammetric equipment and image processing methods and technology. Image correlation techniques are considered according to photogrammetric and mathematical fundamentals as well as the techniques for conversion, correlation, and rectification of video signals. Data processing system programs for the acquisition, storage, and processing of cartographic data are also considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Photogrammetry; Image Processing; Bibliographies

19980010894 Department of the Navy, Washington, DC USA

Spinning Focal Plane Array Camera Particularly Suited for Real Time Pattern Recognition

Garcia, Joseph P., Inventor, Department of the Navy, USA; Aug. 26, 1997; 38p; In English

Patent Info.: US-Patent-Appl-SN-920289

Report No.(s): AD-D018604; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A computer vision system is disclosed that utilizes a spinning array of photodetectors. The array is rotated about the focal plane of a lens and scans all the possible orientations and positions of the edges of the unknown object. In one embodiment, the photodetectors are elongated so as to provide for maximum light gathering ability along the direction of elongation and a minimum light gathering ability in the direction perpendicular to the direction of elongation. In other embodiments, optical means are used to focus the image onto conventional photodetectors while still having the ability to more efficiently determine edge segments of unknown objects. The system efficiently and rapidly implements the wavelet projection transform to characterize-multiscale edge segment features of an image of an unknown object. An imaging radar system that utilizes a spinning antenna system having frequency scanning provisions is also disclosed.

DTIC

Focal Plane Devices; Computer Vision; Photometers; Pattern Recognition; Real Time Operation

19980010999 Civil Aviation Authority, Safety Regulation Group, Gatwick, UK

Flight Recorders-ICAO to JAR OPS

Moore, Pippa, Civil Aviation Authority, UK; Recording Aircraft Accident Data Proceedings; 1997, pp. 1.1-1.15; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

Flight recorders are mandatory pieces of equipment principally intended to assist air accident investigators, although aircraft operators are beginning to use them to determine how their aircraft are being flown and how to improve the performance of the aircraft. The requirements for flight recorders can be traced back to ICAO which specifies the basic need for them and this paper uses the ICAO requirements as a starting point in the definition of the current UK and Joint Aviation Authorities' documentation on this subject.

Author

Aircraft Accidents; Flight Recorders; Documentation

19980011000 Fairchild Weston Systems, Inc., Fairchild Aviation Recorders, Sarasota, FL USA

Evolution of Flight Recorder Media and Protection Techniques

Dismukes, Mart, Fairchild Weston Systems, Inc., USA; Recording Aircraft Accident Data Proceedings; 1997, pp. 2.1-2.5; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The evolution of recording media used in crash survivable flight data recorders is examined. Oscillographic foil, magnetic wire, metal tape, Mylar tape and solid state memory are placed in historical perspective with an examination of their properties and suitability. Emphasis is placed on the current solid state medium, with a brief look at the future.

Author

Flight Recorders; Survival Equipment; Data Recorders

19980011001 British Aerospace Systems and Equipment Ltd., Plymouth, UK

Combined CVR and FDR

Malvern, A. R., British Aerospace Systems and Equipment Ltd., UK; Recording Aircraft Accident Data Proceedings; 1997, pp. 3.1-3.7; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The recording of voice and flight data has significantly improved flight safety over many years, so that the carriage of recorders has been mandated for a large range of aircraft for all ICAO states. For large transport aircraft this is normally in the form of two boxes, an Flight Data Recorder (FDR) and a Cockpit Voice Recorder (CVR). There is ever a need for improved safety as the volume of flights increases steadily. This paper discusses the use of combined recorders, which include both the CVR and FDR in a single box, for a range of applications, either to enhance flight safety by dual redundancy, or to improve operational efficiency by Flight Operation Quality Assurance (FOQA). Applications for military will also be discussed, where there is an enthusiasm for Commercial Off The Shelf Equipment (COTSC).

Author

Data Recorders; Flight Recorders; Flight Safety

19980011002 Bureau Enquetes Accidents, Paris, France

Recovering Data From Non-Volatile Memories

Bastianelli, Jerome, Bureau Enquetes Accidents, France; Giraud, Frank, Bureau Enquetes Accidents, France; Recording Aircraft Accident Data Proceedings; 1997, pp. 6.1-6.10; In English; Also announced as 19980010998; Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

In the context of aircraft accident investigation, the recorders required by law are the flight data recorder and the cockpit voice recorder. Even though these recorders store a large amount of information, they cannot cover every event completely. Aircraft also carry other types of equipment to record data, known as NVM's, a term which covers everything from the GPS found in general aviation to jumbo jet computers. Though their main aim is not related to accident investigation they can, in some cases, provide vital data. After a general presentation of this investigatory technique, a concrete example will show both the wide scope and the limitations of these memories in this context.

Author

Aircraft Accident Investigation; Data Recorders; Flight Recorders

19980011533 NERAC, Inc., Tolland, CT USA

Sensor Fusion: Information Integration from Multi-Sensor Systems. (Latest citations from the INSPEC Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851116; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development and application of sensor fusion technology in a variety of disciplines. Architecture and algorithm descriptions, decision theory aspects, and hardware and software development are among the topics discussed. Applications in target recognition, robotics, and computer vision are included.

NTIS

Bibliographies; Product Development; Multisensor Applications; Multisensor Fusion

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LASERS AND MASERS

Includes parametric amplifiers. For related information see also 76 Solid-State Physics.

19980009626 Arizona Univ., Dept. of Mathematics, Tucson, AZ USA

3D Collapse Phenomena in Dispersive Nonlinear Media: A Critique of Envelope Models *Final Report, 1 Nov. 1993 - 9 Jun. 1997*

Newell, A. C., Arizona Univ., USA; Moloney, J. V., Arizona Univ., USA; Wright, E., Arizona Univ., USA; Jun. 09, 1997; 52p; In English

Contract(s)/Grant(s): F49620-94-I-0051

Report No.(s): AD-A332387; AFOSR-TR-97-0662; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The main goal of the research was to perform a systematic investigation and evaluation of the utility of envelope equations. In particular, the nonlinear Schroedinger equation (NLS) and its generalizations, for modeling self-focusing (SF) collapse phenomena in transparent dielectric media. The work was successfully carried to completion. We (1) developed a theory of critical collapse for pulses in the presence of normal GVD, (2) developed reliable models for ultrashort pulse propagation in water as a model for propagation in the vitreous humor, specifically for propagation in water which accounts for self-focusing collapse, normal GVD, multi-photon absorption and avalanche breakdown and (3) investigated nonlinear reflection properties and have discovered a new phenomenon. The Nonlinear Optical Skin Effect (NOSE) in which a short pulse reflected from the nonlinear absorber suffers a Doppler shift resulting from a moving boundary induced in the medium.

DTIC

Nonlinear Equations; Schroedinger Equation; Group Velocity; Collapse

19980009735 Smithsonian Astrophysical Observatory, Cambridge, MA USA

Hydrogen Maser for Space

Mattison, E. M., Smithsonian Astrophysical Observatory, USA; Boyd, D. A., Smithsonian Astrophysical Observatory, USA; Maddox, J. F., Smithsonian Astrophysical Observatory, USA; Nystrom, G. U., Smithsonian Astrophysical Observatory, USA; Vessot, Robert F. C., Smithsonian Astrophysical Observatory, USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 93-99; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Frequency references - high stability clocks - increasingly find applications in space missions. Atomic clocks of ever increasing stability have present and potential uses as frequency references for the GLONASS and Global Positioning System navigation systems, local oscillators for space-based Very Long Baseline Interferometry, 'proper' clocks for tests of general relativity, frequency references for detection of gravitational radiation, and 'traveling clocks' for worldwide time transfer. The HMC maser is designed for use with a variety of spacecraft, requiring only an appropriate mechanical connection and electrical interface. It was originally to be tested aboard the European Space Agency's EURECA spacecraft, and then, following cancellation of the planned EURECA reflight, on the Russian Mir space station. At present the flight portion of the HMC program has been terminated, and the flight model maser and its electronics are undergoing laboratory testing at SAO.

Author

Hydrogen Masers; Space Missions; Atomic Clocks; Stability

19980009750 Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Inst. fuer Hochfrequenztechnik, Oberpfaffenhofen, Germany

DLR's Research for Space-Maser Monitoring with Two-Way Microwave Links

Hahn, J., Deutsche Forschungsanstalt fuer Luft- und Raumfahrt, Germany; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 225-260; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

This workshop handout presents DLR's research activities for ultra-precise clock monitoring. We will mainly refer to the so called 'H-maser in space' study as part of the ExTRAS project funded by ESA in which we investigated the modification of a two-way microwave ranging instrument for time transfer purposes. This leads to the introduction of the PRARETIME instrument. The expected accuracies for ground to space clock synchronization are presented assuming a H-maser clock onboard the Russian Meteor 3-M satellite. Because ExTRAS was not continued due to financial constraints, an experimental effort has been made to show the PRARE(TIME) capabilities for ultra-precise clock synchronization. The outcome of a joint DLR-GFZ measurement campaign using PRARE on ERS-2 and GPS is presented here. We also want to preview the next planned time experiments, i.e. H-maser on MIR, PHARAO and ACES on ISS ALPHA. to monitor future generation clocks in space more study work has to be done into ultra-precise time links. A proposal is made using the SATRE system to design a time link of the next generation. These results can be included in the concept for a future GNSS 2.

Author

Masers; Monitors; Microwave Sensors; Clocks; Synchronism

19980009803 NERAC, Inc., Tolland, CT USA

Laser Annealing and Hardening. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866777; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning laser annealing, hardening, and surface treatment methods and apparatus. Patents describe surface modification and treatment of semiconductors, metal products, electronic devices, dielectric materials, ceramics, optical devices, and polymer materials. Selected patents also examine treatment of engine parts, laser welding and annealing, and metallization patterns.

NTIS

Dielectrics; Engine Parts; Laser Annealing; Laser Welding; Metallizing; Optical Equipment; Semiconductors (Materials); Surface Treatment

19980009878 Stanford Univ., Edward L. Ginzton Lab. of Physics, Stanford, CA USA

High-Power CW Diode-Laser-Array-Pumped Solid-State Lasers and Efficient Non-Linear-Optical Frequency Conversion Final Report, 15 Feb. 1994 - 15 May 1997

Tulloch, W., Stanford Univ., USA; Rutherford, T., Stanford Univ., USA; Route, R. K., Stanford Univ., USA; Byer, Robert L., Stanford Univ., USA; Oct. 22, 1997; 48p; In English

Contract(s)/Grant(s): DAAH04-94-G-0019

Report No.(s): AD-A332105; GL-5563; ARO-32333.7-PH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goals of this program were: development of high-power, cw diode-laser-array-pumped, Nd:YAG lasers, and efficient nonlinear frequency conversion of their output. Two minislabs laser heads constructed as a single high power dual-head oscillator (96W, multi-mode) were operated separately to support Q-switched and cw nonlinear frequency conversion studies and single-frequency injection-locking studies and the start of cw amplifier research. A cw singly resonant optical parametric oscillator (SRO) utilizing bulk periodically poled LiNbO₃ (PPLN) for tunable mid-IR radiation using the Q-switched laser as the pump was developed, and SHG output at 532 nm was increased from 800 mW average power (15 KHz rep rate) to 1300 mW average power (8.4 KHz rep rate). Coherent laser radar with high-power, high-coherence sources was pursued through a highly-coherent master oscillator cw power amplifier approach. We operated one laser head as a (10W TEM₀₀) oscillator and the second laser head as a triple-pass amplifier achieving 26 W TEM₀₀ output. More extensive experiments on cw diode-laser pumped laser amplifiers for high-power, high-coherence sources were carried out to test the ability of theoretical modeling to predict amplifier output power.

DTIC

High Power Lasers; Continuous Wave Lasers; Laser Pumping; YAG Lasers; Neodymium Lasers; Laser Outputs

19980010456 California Univ., Electronics Research Lab., Berkeley, CA USA

Femtosecond Laser Probing of Non-Thermal Electronic Transport. AASERT Program Final Report, 1 Sep. 1993 - 31 Aug. 1997

Bokor, Jeffrey, California Univ., USA; Sep. 30, 1997; 53p; In English

Contract(s)/Grant(s): F49620-93-I-0353; AF Proj. 3484

Report No.(s): AD-A330571; UCB/ERL-97/1; AFOSR-97-0534TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The goal of this research effort has been the application of high intensity THz pulses, generated by a large aperture planar photoconducting transmitter, in studying nonlinear phenomena in GaAs and Si. The ultimate interest in this is a better understanding of the response of free carriers in semiconductors to high electric fields, a subject of great importance in modern electronic devices. The THz generator offers the capability of producing a peak electric field in the range of 100 kV/cm, well into the range of high-field, hot carrier phenomena. In addition, due to the short duration of this pulse, the dynamics of carriers in high fields may be studied directly in the time domain, using the powerful techniques developed for femtosecond laser spectroscopy experiments. At high fields, carrier velocities become nonlinear in applied field. This forms the basis for the expectation of a nonlinear response of a doped semiconductor to a high intensity THz pulse passing through it.

DTIC

Gallium Arsenides; Laser Spectroscopy; Nonlinearity; Semiconductors (Materials); Transmitters

19980010559 NERAC, Inc., Tolland, CT USA

Semiconductor Laser Amplifiers (Latest Citations from the Ei Compendex*Plus Database)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863568; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the performance and operating characteristics of semiconductor laser amplifiers. Citations include traveling wave, near-traveling wave, four wave, tapered waveguide, titled waveguide, and quantum well laser amplifiers. Topics include frequency conversion, optical pumping, multiplexing, demultiplexing, laser theory, circuit theory, mathematical models, gain control, and signal distortion.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Light Amplifiers; Semiconductor Lasers

19980010810 Advanced Technical Concepts, Berkshire, NY USA

Application of the Model Reference Approach in Laser Beam Steering Systems Final Report, Jun. 1996 - May 1997

Skormin, Victor A., Advanced Technical Concepts, USA; Oct. 1997; 81p; In English

Contract(s)/Grant(s): F30602-96-C-0088; AF Proj. 4519

Report No.(s): AD-A331936; RL-TR-97-203; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A model reference control system has been developed to adaptively control the pointing function of a 'Pointing, Acquisition and Tracking' system in a satellite-based Laser Communication system. This approach allows the description of the system transfer behavior to be defined in software, and the behavior of the real system to be driven to this software model. The consequence is the isolation of the real, transient and wear affected system from the ideal, modeled system performance, allowing the 'forcing function' of the controller to correct for transients (e.g. platform jitter) and for long term effects of wear and operational conditions. The use of this technique in compensating for bending modes in less expensive optical mirror systems has been experimentally demonstrated. The consequence of using this improved pointing accuracy and the associated improvement in burst error performance to allow transient control of output carrier power is suggested as a means of enhancing system reliability.

DTIC

Laser Beams; Beam Steering; Models; Product Development; Tracking (Position); Target Acquisition

19980010864 Wisconsin Univ., Dept. of Electrical and Computer Engineering, Madison, WI USA

Microwave Absorption and Reflection from Ultraviolet Laser and Electron Cyclotron Resonance Produced Plasma Sheet Final Report, 1 Aug. 1993 - 31 Jul. 1997

Scharer, John E., Wisconsin Univ., USA; Kelly, Kurt L., Wisconsin Univ., USA; Jan. 1997; 22p; In English

Contract(s)/Grant(s): F49620-93-I-0465; AF Proj. 3484

Report No.(s): AD-A331430; AFOSR-97-0577TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report contains information regarding progress on experiments associated with microwave reflection, absorption, and transmission with a laser produced plasma sheet. The progress report is in response to AFOSR AASERT Award. The objective of this research is to create a laser produced plasma with a high enough density to reflect or absorb microwaves. The plasma acts as an inertialess reflective or absorptive surface which can be used as an agile mirror in the reflective case, or as a cloaking shield in the absorptive case. During the past year a new laser was purchased to assist in the research. The new laser installation was accomplished in August 1996. A new heterodyne detection system was also studied to see its benefits as compared to a homodyne

system used previously. The National Instruments data acquisition package LabView 4.0.1 was purchased for better interaction with Tektronix oscilloscopes. A new LabView driver was programmed into an updated PowerMac computer.

DTIC

Homodyne Reception; Installing; Laser Outputs; Lasers; Microwave Absorption; Microwaves; Mirrors; Optical Resonance; Ultraviolet Lasers

19980010933 City Univ. of New York, Research Foundation, NY USA

Hot Electron Ge/Si Lasers Final Report, 1 Sep. 1994 - 31 Mar. 1997

Shum, Kai, City Univ. of New York, USA; Jun. 13, 1997; 15p; In English

Contract(s)/Grant(s): F49620-93-1-0619; AF Proj. 4276

Report No.(s): AD-A329725; AFOSR-TR-97-0418; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

There are two major parts in this report. The first part concentrates on the photoluminescence studies of SiGe layers grown on Si. The second part reports on the investigation of novel nonvolatile random access memory devices. For the first part multiple exciton complexes confined in potential wells produced by alloy fluctuations are identified. It is found that the size of exciton complex is critically dependent of the size of potential well. The blue-shift of an optical transition line(D1) associated with dislocations is observed and correlated with Si-Ge interatomic diffusion at partial dislocation cores. For the second part, it is unambiguously determined that the band alignment is type II at the interface of ZnCdSe and InP. Negative differential resistance is observed in a single heterointerface well barrier structure with a current peak-to-valley ratio of 30 at room temperature. A bi resistance device using ZnCdMgSe/InP heterostructure was designed and demonstrated. A novel architecture is proposed for nonvolatile electrical random access memory based on the demonstrated bi-resistance device.

DTIC

Germanium; Silicon; Photoluminescence; Hot Electrons; Lasers; Random Access Memory; Excitons; Computer Storage Devices

19980011623 JAYCOR, San Diego, CA USA

Dynamics of Semiconductor Lasers Under External Optical Injection Final Report, Sep. 1994 - Aug. 1997

Simpson, Thomas B., JAYCOR, USA; Aug. 1997; 133p; In English

Contract(s)/Grant(s): F29601-94-C-0166; AF Proj. 3326

Report No.(s): AD-A331996; JAYCOR-J211-97-0071/7211; PL-TR-97-1143; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Injection of an external optical signal into the oscillating mode of a semiconductor laser can modify the coupling between the circulating optical field and the carrier density (gain medium). The external optical signal modifies both the gain and the refractive index of the semiconductor gain medium by changing the free-carrier density. Depending on the strength of the optical injection and the frequency offset between the injected signal and the free-running oscillation frequency, this can lead to modulated output including multiwave mixing, unstable dynamics, and deterministic chaos, or to significantly improved modulation and noise characteristics relative to the free-running case. Experimental investigations were coupled with numerical and analytical modeling to investigate the modified output in a commercially available laser diode and a vertical-cavity surface-emitting laser (VCSEL). The modeling used a conventional coupled-equation model which, we found, identifies the key phenomena that we observe in our data.

DTIC

Semiconductor Lasers; Surface Emitting Lasers; Laser Cavities

19980011682 Columbia Univ., Dept.of Applied Physics, New York, NY USA

Third and Seventh Harmonic Free Electron Laser Coherent Millimeter Radiation, and Studies of Short-Pulse Emission from FEL, 1 Feb. 1995 - 30 Jun. 1997

Marshall, T. C., Columbia Univ., USA; Dec. 1997; 41p; In English

Report No.(s): AD-A332952; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Two and one-half years research at the Columbia Free Electron Laser facility are summarized with an introductory overview followed by a selection of key reprints. Topics include: Short pulse high power millimeter emission using the Cerenkov effect in a dielectric-loaded waveguide, and coherent phase-reference harmonic radiation from a waveguide FEL. The latter is an experimental demonstration, while the first two topics are theoretical studies.

DTIC

Free Electron Lasers; Harmonic Radiation; Dielectric Waveguides; Coherent Radiation

19980011997 Michigan Univ., Center for Ultrafast Optical Science, Ann Arbor, MI USA

Advanced Pulsed Laser Deposition System with In-Situ Ellipsometric Diagnostics *Final Report, 1 Aug. 1995 - 31 Jul. 1997*

Pronko, Peter, Michigan Univ., USA; Nov. 06, 1997; 13p; In English

Contract(s)/Grant(s): F49620-95-I-0474

Report No.(s): AD-A332887; AFOSR-97-0706TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The proposal described and requested funding for part of what is intended to become a larger system representing an optics-based research facility for ultrafast pulsed laser deposition and characterization of modulated films, coatings, and surface structures. An in-situ diagnostics approach is used as a process control, through real-time feedback, in manufacturing multilayer thin films and coatings. Experimental facilities employing optical techniques, in conjunction with other more conventional particle monitoring and control methods, provides new and advanced capability, as well as greater insight, into complex thin-film fabrication. Such insight has been, and continues to be, demanded by sophisticated industrial and government end users. The present program is aimed at establishing a multi-port pulsed laser vacuum deposition chamber with an in-situ multi-wavelength ellipsometer to be used as an optical diagnostic and feedback control device. This system will be attached to a versatile high average power ultrafast pulsed laser for the experimental development and fabrication of modulated thin-film materials and multilayers. It is intended to be a collaborative and interdisciplinary research facility set up at the Center for Ultrafast Optical Science at the University of Michigan.

DTIC

Pulsed Lasers; Real Time Operation; Research Facilities; Vacuum Deposition; Control Equipment; Feedback Control; Laser Deposition

37

MECHANICAL ENGINEERING

Includes auxiliary systems (nonpower); machine elements and processes; and mechanical equipment.

19980009138 NASA Lewis Research Center, Cleveland, OH USA

Computerized Simulation of Meshing of Conventional Helical Involute Gears and Modification of Geometry

Litvin, F. L., Illinois Univ., USA; Lu, J., Illinois Univ., USA; Townsend, D. P., NASA Lewis Research Center, USA; Hawkins, M., Allison Engine Co., USA; Jul. 1997; 22p; In English

Contract(s)/Grant(s): NAG3-1822; RTOP 581-30-13; DA Proj. 1L1-62211-A-47-A

Report No.(s): AD-A330099; NASA-TM-107451; E-10732; NAS 1.15:107451; ARL-TR-1370; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An approach is proposed for computerized simulation of meshing of aligned and misaligned involute helical gears. Algorithms for TCA (Tooth Contact Analysis) computer programs were developed. Influence of misalignment on the shift of the bearing contact and transmission errors has been investigated. Numerical examples that illustrate the developed theory are provided.

DTIC

Gears; Computerized Simulation

19980009149 NERAC, Inc., Tolland, CT USA

High Pressure Seals. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866900; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning fabrication techniques and applications of high pressure seals for the containment of, and leak prevention in, a variety of fluid-handling devices. Specific applications are referenced, including use in pump assemblies, pressure vessels, and drive mechanisms. The patents also reference use in piston devices and well boring operations.

NTIS

Bibliographies; Seals (Stoppers); Fabrication; Technologies

19980009221 NERAC, Inc., Tolland, CT USA

Mechanical Face Seals: Lubrication and Wear Resistance. (Latest Citations from Fluidex)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865225; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, development and applications of mechanical face seals relative to antifriction behavior, improved materials, lubricant effects, and accelerated model wear tests. Performance evaluations in mining, gas turbine engines, and pumps are included.

NTIS

Bibliographies; Seals (Stoppers); Lubrication; Wear Resistance; Design Analysis; Product Development

19980009224 NERAC, Inc., Tolland, CT USA

Abrasive Wear: Theoretical and Practical Considerations. (Latest Citations from Information Services in Mechanical Engineering Database)

Apr. 1996; In English

Report No.(s): PB96-866975; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theoretical, experimental, and practical considerations of abrasive wear. References examine wear for a variety of materials and surfaces, including tools, machinery and equipment. Wear mechanisms, wear resistance, and wear protection are emphasized.

NTIS

Bibliographies; Wear Resistance; Mathematical Models; Data Acquisition

19980009230 NERAC, Inc., Tolland, CT USA

Engine Performance. (Latest Citations from the Ei Compindex*Plus Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866512; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning performance of various type of engines. Topics include stirling, turbine, pulse-jet, 2-cycle, diesel, 4-cycle, turbo, and hydrogen engines. Methods for improving performance, including microprocessor controlled electronics, are referenced. Fuel injectors manufactured to specification are also referenced. Performance testing under high or low temperatures are studied.

NTIS

Bibliographies; Turbines; Performance Tests; Microprocessors

19980009238 NERAC, Inc., Tolland, CT USA

Stirling Engines (Latest Citations from the Ei Compindex*Plus Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869698; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning Stirling engine technology. Design, development, performance testing, and applications are discussed, including power generation, cryogenic cooling, solar power applications, and ground and marine vehicles. The citations also examine engine component design and material testing results. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Stirling Engines; Engine Design; Product Development; Performance Tests

19980009886 Gas Research Inst., Chicago, IL USA

Guidance to Users of EDO Canada LiteRider (Trade Name) NGV Cylinders Topical Report

Liss, W. E., Gas Research Inst., USA; Oppenheimer, A. J., Gas Research Inst., USA; May 1997; 29p; In English

Report No.(s): PB97-181309; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This brief report provides information to users of LiteRider (R) gas cylinders manufactured by EDO Canada Ltd, to address the reports of leaks from these cylinders, especially in view of recent bankruptcy of the manufacturer. The background information

is provided, supported (in appendixes) by documentation of cylinder failures and recommendations on cylinder inspection and leak test procedures.

NTIS

Cylinders; Leakage; Failure; Gases

19980010826 Wayne State Univ., Center for Automotive Research, Detroit, MI USA

Autoignition and Combustion in Diesel Engines Under Cold Starting Conditions *Final Report*

Henein, Naeim A., Wayne State Univ., USA; Sep. 29, 1997; 78p; In English

Contract(s)/Grant(s): DAAL03-88-K-0016

Report No.(s): AD-A332331; ARO-25190-2-EG; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This report includes the results of an investigation on the autoignition and combustion processes in diesel engines at low ambient temperatures. Experiments were conducted on three different single-cylinder direct-injection, four-stroke engines, using fuels of different cetane numbers and physical properties. Tests covered ambient temperatures ranging from 250 C to -250 C. The engines were soaked at least eight hours before a cold start test. The analysis indicated that the difficulty in starting diesel engines is caused by combustion instability at low temperatures. Combustion instability will cause the engine to misfire once before it fires again. This is referred to as 8-stroke-cycle operation. If it misfires twice, it is referred to as 12-stroke-cycle operation, and so on. This pattern was found to be reproducible. The engine may start on a 12-stroke-cycle operation at low temperatures, shift to an 8-stroke-cycle, and finally shifts to the regular 4-stroke-cycle. This pattern has been found not to be engine or fuel specific. A detailed thermodynamic and combustion analysis of the experimental data indicated that the cause for combustion instability is a combination of dynamic, physical and chemical kinetics factors. Recommendations are made to reduce combustion instability by using the electronic controls already available on engines.

DTIC

Diesel Engines; Combustion Stability; Performance Tests; Spontaneous Combustion

19980010829 Wayne State Univ., Center for Automotive Research, Detroit, MI USA

Diesel Engine Cold-Starting Studies: Optically Accessible Engine Experiments and Modeling *Final Report*

Henein, Naeim A., Wayne State Univ., USA; Lai, Ming-Chia, Wayne State Univ., USA; May 01, 1997; 70p; In English

Contract(s)/Grant(s): DAAL03-92-G-0168

Report No.(s): AD-A332339; ARO-29302.1-EG; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

An experimental and numerical study was carried out to simulate the diesel spray breakup, vaporization, ignition, and combustion during cold starting conditions. This report summarizes the optical diagnostics and multi-dimensional computation results for two single-cylinder optically accessible engines. The results showed that optically accessible engines provide very useful information for studying the diesel cold starting conditions, which also provide a critical test for diesel combustion models. The pre-ignition chemistry showed great sensitivity to the compressed air temperature. KIVA with a modified shell model responds accordingly to the change of inlet air temperatures and fuel injection parameters. However, other submodels do not have enough sensitivity to simulate the starting of diesel engine without careful validation and further improvements. A method to compute the ignition delay in engines from data obtained in constant volume vessels was also developed. The method accounts for the effect of variations in charge pressure and temperature on the formation of the chain carriers from the combustible mixture during the ID period. A comparison is made between the computed ID and data obtained in a LABECO research engine under different ambient temperatures ranging from +200 to - 100 C.

DTIC

Ambient Temperature; Combustion Physics; Compressed Air; Computation; Internal Combustion Engines

19980011527 NERAC, Inc., Tolland, CT USA

Lubrication for High and Extreme Pressures. (Latest citations from the US Patent Bibliographic File with Exemplary Claims)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851272; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning compositions and applications of Extreme Pressure (EP) lubricants. The citations include compositions and methods of producing lubricant additives containing boron, sulfur, phospho-

rous, organic compounds, and metal complexes. Applications include lubricants for gears, metal working, wire drawing, vehicles, and machines.

NTIS

Bibliographies; Lubricants; High Pressure; Technologies

19980011883 Science Applications International Corp., McLean, VA USA

Advanced Lineal Generators: Proof of Concept Final Report

Bergeron, George, Science Applications International Corp., USA; Kirkpatrick, Douglas, Science Applications International Corp., USA; Sep. 1997; 17p; In English

Contract(s)/Grant(s): DAAH04-96-C-0061

Report No.(s): AD-A332142; ARO-35717.1-CH; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

SAIC, in association with O'Neill Development Company, completed a proof-of-concept study of a unique engine-generator system that uses opposed cylinders to drive a common piston linearly back and forth through a solenoid. We found that the basic concept of the "lineal generator" is viable. It offers a number of advantages: its relatively simple design will result in improved mechanical robustness and cost savings, and it is easily customized to specific applications. There are a number of challenges that must be addressed: for example, the lack of rotational components makes starting the device mechanically difficult, structural alignment is critical, and balanced engine and load parameters are crucial. Though the levels of complexity are different, each can be successfully addressed through careful component design and engineering. Because this technology offers such promise, SAIC is continuing development of the device for commercial applications.

DTIC

Diesel Engines; Electric Generators; Electric Power Transmission

38

QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

19980009273 California Univ., San Diego, La Jolla, CA USA

Non-Invasive Photochromic-Tracer Studies of Particulate Suspensions and Granular Media Final Report, 1 Jun. 1993 - 31 May 1997

Goddard, J. D., California Univ., San Diego, USA; Aug. 01, 1997; 8p; In English

Contract(s)/Grant(s): F49620-93-I-0381; F49620-92-J-0037; F49620-96-I-0246

Report No.(s): AD-A329666; AFOSR-TR-97-0430; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The purpose of this report was to provide participation in the development of a non-invasive 3-D experimental visualization technique to probe the microstructure in deforming granular assemblages and particulate suspensions. The technique is based on the generation of transient streaks of colored particles in transparent fluid particle systems by means of the photochromic effect. Such streaks would then serve as tracers of motion within the particulate system. As one candidate system, a model transparent sand was made from crushed photochromic glass dispersed in a refractive index matched ZnCl solution. While the speed of the photochromic effect prevented the penetration of a mechanically non-invasive light beam into the system, other means have been explored for introduction of photochromically darkened particles.

DTIC

Flow Visualization; Sediments; Particulates; Nonintrusive Measurement

19980009289 Swedish Nuclear Power Inspectorate, Stockholm, Sweden

Experimental validation of UTDefect

Eriksson, A.S., ABB Tekniska Roentgencentralen A.B., Sweden; Bostroem, A., Chalmers Univ. of Technology, Sweden; Wirde-lius, H., Chalmers Univ. of Technology, Sweden; Jan. 1997; ISSN 1104-1374; 50p; In English

Contract(s)/Grant(s): SKI Proj. 95072; SKI Proj. 96042

Report No.(s): SKI-R-97-3; DE97-620664; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This study reports on conducted experiments and computer simulations of ultrasonic nondestructive testing (NDT). Experiments and simulations are compared with the purpose of validating the simulation program UTDefect. UTDefect simulates ultrasonic NDT of cracks and some other defects in isotropic and homogeneous materials. Simulations for the detection of surface breaking cracks are compared with experiments in pulse-echo mode on surface breaking cracks in carbon steel plates. The echo dynamics are plotted and compared with the simulations. The experiments are performed on a plate with thickness 36 mm and

the crack depths are 7.2 mm and 18 mm. L- and T-probes with frequency 1, 2 and 4 MHz and angles 45, 60 and 70 deg are used. In most cases the probe and the crack is on opposite sides of the plate, but in some cases they are on the same side. Several cracks are scanned from two directions. In total 53 experiments are reported for 33 different combinations. Generally the simulations agree well with the experiments and UTDefect is shown to be able to, within certain limits, perform simulations that are close to experiments. It may be concluded that: For corner echoes the eight 45 deg cases and the eight 60 deg cases show good agreement between experiments and UTDefect, especially for the 7.2 mm crack. The amplitudes differ more for some cases where the defect is close to the probe and for the corner of the 18 mm crack. For the two 70 deg cases there are too few experimental values to compare the curve shapes, but the amplitudes do not differ too much. The tip diffraction echoes also agree well in general. For some cases, where the defect is close to the probe, the amplitudes differ more than 10-15 dB, but for all but two cases the difference in amplitude is less than 7 dB.

DOE

Computerized Simulation; Carbon Steels; Nondestructive Tests; Metal Plates; Cracks; Ultrasonic Flaw Detection; Program Verification (Computers)

19980009292 Lockheed Idaho Technologies Co., Idaho Falls, ID USA

National Metal Casting Research Institute final report. Development of an automated ultrasonic inspection cell for detecting subsurface discontinuities in cast gray iron, Volume 3 Final Report

Burningham, J. S., University of Northern Iowa, USA; Aug. 1995; 84p; In English

Contract(s)/Grant(s): DE-FC07-92ID-13164

Report No.(s): DOE/ID/13164-1-Vol-3; DE95-016313; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This inspection cell consisted of an ultrasonic flaw detector, transducer, robot, immersion tank, computer, and software. Normal beam pulse-echo ultrasonic nondestructive testing, using the developed automated cell, was performed on 17 bosses on each rough casting. Ultrasonic transducer selection, initial inspection criteria, and ultrasonic flow detector (UFD) setup parameters were developed for the gray iron castings used in this study. The software were developed for control of the robot and UFD in real time. The software performed two main tasks: emulating the manual operation of the UFD, and evaluating the ultrasonic signatures for detecting subsurface discontinuities. A random lot of 105 castings were tested; the 100 castings that passed were returned to the manufacturer for machining into finished parts and then inspection. The other 5 castings had one boss each with ultrasonic signatures consistent with subsurface discontinuities. The cell was successful in quantifying the ultrasonic echo signatures for the existence of signature characteristics consistent with Go/NoGo criteria developed from simulated defects. Manual inspection showed that no defects in the areas inspected by the automated cell avoided detection in the 100 castings machined into finished parts. of the 5 bosses found to have subsurface discontinuities, two were verified by manual inspection. The cell correctly classified 1782 of the 1785 bosses (99.832%) inspected.

DOE

Nondestructive Tests; Cast Alloys; Real Time Operation; Ultrasonic Tests; Castings; Iron Alloys; Inspection; Defects

19980009344 NERAC, Inc., Tolland, CT USA

Ultrasonic Phased Arrays (Latest Citations from the INSPEC Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869656; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development and applications of ultrasonic phased arrays. Many citations relate to medical ultrasonic imaging. Other topics include imaging systems, transducer design and construction, ultrasonic inspection, and robotic sensing systems. Some attention is given to computerized image analysis. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Phased Arrays; Ultrasonics; Bibliographies

19980009534 Mansour Engineering, Inc., Berkeley, CA USA

Assessment of Reliability of Ship Structures Final Report

Mansour, A., Mansour Engineering, Inc., USA; Wirsching, P., Mansour Engineering, Inc., USA; Luckett, M., Mansour Engineering, Inc., USA; Plumpton, A., Mansour Engineering, Inc., USA; 1997; 424p; In English

Report No.(s): PB97-141584; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

The objectives of this study are detailed as follows: (1) Provide a methodology for assessing the reliability level of the structure of existing ships. The computerized methodology will estimate failure probabilities associated with each identified failure mode. (2) Select four ships and perform reliability analysis relative to each identified failure mode for each select ship. (3) Recommend minimum acceptable reliability levels for each ship type and failure mode to be used as guidelines for ship designers for future ships. (4) Provide a methodology for performing sensitivity analysis of reliability levels to variations in design parameters, i.e., loads and stresses, materials and strength, and geometry of the structure. (5) On the basis of the sensitivity analysis performed, recommend design strategies that are likely to have the highest payoffs in terms of reliability.

NTIS

Design Analysis; Reliability Analysis; Probability Theory; Mechanical Properties; Failure Modes; Loads (Forces)

19980009546 NERAC, Inc., Tolland, CT USA

Deming Method: Quality Control. (Latest citations from the ABI/Inform Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-868302; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the Deming approach to quality control. Topics include examples of applications in specific industries, including manufacturing, health care, and public sector services. Some attention is given to theoretical considerations and to enhancements of the original concepts. The effects of implementation on productivity and service quality are also considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Quality Control

19980009636 NERAC, Inc., Tolland, CT USA

Quality Improvement. (Latest citations from the ABI/Inform Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-868328; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning continuous quality improvement (CQI), a management strategy which involves each member of the organization in building quality into every step of the operation. Citations discuss the approach required for total quality improvement (TQI) success, including participative management, education, and communication. Examples of industrial and healthcare quality improvement programs are described. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Total Quality Management

19980009994 Space and Naval Warfare Systems Command, Washington, DC USA

Department of Defense Handbook for Reliability Test Methods, Plans, and Environments for Engineering, Development, Qualification, and Production

Apr. 1996; 411p; In English; Supersedes

Report No.(s): AD-A330773; MIL-HDBK-781A; No Copyright; Avail: CASI; A18, Hardcopy; A04, Microfiche

The purpose of this handbook is to provide test methods and test environmental profiles which can be used in reliability testing during the development qualification and production of systems and equipment.

DTIC

Defense Program; Product Development; Qualifications

19980010174 Dayton Univ., Research Inst., OH USA

Nondestructive Methods for Evaluating Damage Evolution and Material Behavior in Metal Matrix Composites Final Report, 15 Aug. 1993 - 14 Feb. 1997

Karpur, Prasanna, Dayton Univ., USA; Feb. 1997; 226p; In English

Contract(s)/Grant(s): F49620-93-I-0461

Report No.(s): AD-A329643; UDR-TR-97-33; AFOSR-97-0438TR; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

The overall program consisted of two distinct phases with objectives. Phase 1 objective: to characterize the evolution of isothermal fatigue damage using nondestructive evaluation techniques and correlate this information with residual strength of the

composite. Phase 2 objective: to characterize and compare the evolution of damage due to creep and TMF fatigue of metal matrix composites (SCS-6/Ti-6Al-4V manufactured by Textron Specialty Materials) using nondestructive evaluation techniques and thereby derive an 'inefficiency factor' for damage accumulation under in-phase thermomechanical fatigue (IP-TMF). Phase 1 results: The first phase of the program concluded that the usefulness of ultrasonic nondestructive evaluation to assess fatigue damage in a 06 Sigma-1240/Ti-6242 composites has been demonstrated through correlation of immersion and in situ ultrasonic data with residual tensile strength. Immersion surface wave scanning proved to be one of the most promising methods for correlating fatigue damage with the residual tensile strength for the composite used in this study. This study demonstrated that in situ nondestructive ultrasonic longitudinal wave and acoustic emission techniques can monitor the onset and accumulation of damage produced by either sustained loading or in-phased thermomechanical fatigue loading in a titanium matrix composite.

DTIC

Metal Matrix Composites; Fatigue (Materials); Nondestructive Tests; Residual Strength; Tensile Strength

19980010234 NASA Langley Research Center, Hampton, VA USA

An OSEE Based Portable Surface Contamination Monitor

Perey, Daniel F., NASA Langley Research Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 469-476; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Many industrial and aerospace processes involving the joining of materials, require sufficient surface cleanliness to insure proper bonding. Processes as diverse as painting, welding, or the soldering of electronic circuits will be compromised if prior inspection and removal of surface contaminants is inadequate. As process requirements become more stringent and the number of different materials and identified contaminants increases, various instruments and techniques have been developed for improved inspection. One such technique based on the principle of Optically Stimulated Electron Emission (OSEE) has been explored for a number of years as a tool for surface contamination monitoring. Some of the benefits of OSEE are: it's non-contacting; requires little operator training; and has very high contamination sensitivity. This paper describes the development of a portable OSEE based surface contamination monitor. The instrument is suitable for both hand-held and robotic inspections with either manual or automated control of instrument operation. In addition, instrument output data is visually displayed to the operator and may be output to an external computer for archiving or analysis.

Author

Contamination; Inspection; Cleanliness; Surface Properties; Monitors; Measuring Instruments

19980010451 Air Force Inst. of Tech., School of Logistics and Acquisition Management, Wright-Patterson AFB, OH USA

A Comparative Study and Estimation of the Life-Cycle Cost Impact of Application of Real-Time Non-Intrusive (RTNI) Monitoring Technology to Real-Time Embedded Systems

Lewis, Michael D., Air Force Inst. of Tech., USA; Jan. 1997; 84p; In English

Report No.(s): AD-A329955; AFIT-GSS/LAS-97D-2; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The use of Real Time Non-Intrusive (RTNI) monitoring has had an impact on life cycle costs of existing programs through a reduction in debug time. Other areas in which RTNI monitoring can provide potential benefits to future programs are through the use of increased dynamic testing and the sharing of testing time among more engineers. There are a number of areas in which software life cycle costs are impacted by various cost drivers. To determine which areas were affected by the use of RTNI monitoring, a panel of expert users of RTNI monitoring was created using a form of the Nominal Group Technique (NGT) methodology to achieve a consensus from a group of experts. The group concluded that the above areas were most important across their programs. However, simply using RTNI monitoring may not have a major impact on future programs, unless it is accompanied by the commitment from management to successfully integrate it into the test programs of those future programs.

DTIC

Life Cycle Costs; Real Time Operation; Embedding; Computer Programming; Nonintrusive Measurement

19980012004 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Current and Proposed Practices for Nondestructive Highway Pavement Testing

Kestler, Maureen A., Army Cold Regions Research and Engineering Lab., USA; Nov. 1997; 12p; In English

Contract(s)/Grant(s): Proj. 4A7-62784-AT42

Report No.(s): AD-A332987; CRREL-SP-97-28; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In September 1994 the U.S. Army Cold Regions Research and Engineering Laboratory (CRREL) distributed a short survey on nondestructive testing practices to each of the 50 state Departments of Transportation (DOTs). The compilation of results constituted Phase I of a multiphase effort intended to lead toward the development of a method for optimizing falling weight deflectometer (FWD) test point spacing. Planned spatial statistical analyses on selected data sets will yield (site-specific) optimal

FWD test point spacing for road network evaluation and pavement overlay design. Optimal FWD test point spacing reduces conservative overdesign due to undertesting and reduces overtesting. Both of these ultimately reduce expenditures. Although the above effort has not been completed, this interim report outlines the proposed process. Also included (and perhaps of more immediate interest to state DOTs) are direct survey facts and figures, including number of states with nondestructive testing (NDT) devices, average number of miles of annual overlay design, average number of miles of network/inventory testing, and back-calculation programs and overlay design procedures used. All facts and figures are generic and honor state anonymity.

DTIC

Highways; Low Temperature Environments; Nondestructive Tests; Procedures; Statistical Analysis; Transportation

39

STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress. For applications see 05 Aircraft Design, Testing and Performance and 18 Spacecraft Design, Testing and Performance.

19980009106 NASA Langley Research Center, Hampton, VA USA

Finite Element Structural Analysis in Parallel on an iPSC/860

Storaasli, Olaf O., NASA Langley Research Center, USA; Baddourah, Majdi, Lockheed Engineering and Sciences Co., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 431-474; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Finite Element Structural Analysis is the most widely used technique in designing new aerospace, automotive, maritime and offshore structures on today's high-performance computers. However, new algorithms are required to fully exploit parallelism for Finite Element analysis on distributed memory supercomputers such as the iPSC/860 to achieve rapid analysis and cost-effective solutions. For several years, the Structural Mechanics Division at NASA Langley has recognized the potential of such distributed memory architectures as the iPSC/860, and has conducted algorithm research which has led to the development of some of the first finite element structural analysis software for distributed memory computers. This software consists of a novel, node-by-node parallel-vector method for element generation and assembly (PVBUILD)¹ and a high-performance Choleski-based equation solver (PVSOLVE).² PVBUILD significantly reduces the synchronization and communication bottlenecks associated with the conventional element-by-element generation and assembly kernels used by nearly all finite element programs. This new method permits the solution of larger, more complex aerospace structural analysis problems and is ideally suited for both shared and distributed memory computers. In finite element analysis, the bulk of the element generation time is associated with matrix-vector computations. For a NASA Geosynchronous Orbiting Platform model containing 3188 equations and a small bandwidth of 108, the prototype PVBUILD software (without optimization) achieved 10 MFLOPS for each iPSC/860 processor using double precision throughout. Other examples with larger bandwidths exceed 12 MFLOPS in double precision. In order to achieve accurate results for structural analysis problems, computations must be performed in double precision. Since individual finite element matrices are singular, and for large-scale applications, the assembly of these matrices results in an overall stiffness matrix which is near singular (high condition number), a direct solver such as the Choleski-based PVSOLVE is required, since iterative solvers fail to converge. The authors have tested a parallel Choleski solver and achieved 90 MFLOPS without full vectorization or optimization using 32 iPSC/860 processors. With minor modification to PVSOLVE as used on other sequential computers, the authors achieved 6.5 MFLOPS using double precision on one iPSC/860 processor for the equation solution portion of the analysis of the Geosynchronous Platform structure. Work is ongoing to extend PVSOLVE to multiple processor with a target of 160 MFLOPS on the 32-processor iPSC/860 at NASA Langley. Significantly higher performance is anticipated on iPSC/860 systems at NASA Ames with 128 processors and Caltech with 528 processors (with reduced communication overhead). The basic innovation is a method to perform generation, assembly and solution of finite element structural analysis problems using a partitioned node-by-node approach on distributed-memory architecture multicomputers with minimal synchronization and communication overhead. The software provides the building blocks for the development of a general-purpose finite element code on the iPSC/860.

Author

Architecture (Computers); Cost Effectiveness; Distributed Memory; Finite Element Method; Marine Technology; Matrices (Mathematics); Memory (Computers); Multiprocessing (Computers)

19980009286 Sydney Univ., Centre for Advanced Structural Engineering, Australia

Bolted Connection Tests of Thin G550 and G300 Sheet Steels Topical Report

Rogers, C. A., Sydney Univ., Australia; Hancock, G. J., Sydney Univ., Australia; Aug. 1997; 174p; In English Report No.(s): PB97-207799; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Cold formed structural members are fabricated from sheet steels which must meet the material requirements prescribed in applicable national design standards. This report details the findings of bolted connection tests using G550 and G300 sheet steels which range in base metal thickness from 0.42 to 0.60 mm. Test specimens were milled from the longitudinal, transverse and diagonal directions of the sheet to determine the degree of anisotropy and its effect on connection capacity and failure type. All specimens failed in one of three distinct modes; end pull-out, bearing or net section fracture.

NTIS

Bolted Joints; Steels; Metal Sheets; Structural Members; Performance Tests

19980009327 NASA Marshall Space Flight Center, Huntsville, AL USA

The Impact Response of Carbon/Epoxy Laminates (Center Director's Discretionary Fund, Project No. 94-13) Final Report

Nettles, A. T., NASA Marshall Space Flight Center, USA; Hodge, A. J., NASA Marshall Space Flight Center, USA; Nov. 1997; 178p; In English

Report No.(s): NASA/TM-97-206317; NAS 1.15:206317; M-844; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Low velocity dropweight impact tests were conducted on carbon/epoxy laminates under various boundary conditions. The composite plates were 8-ply (+45,0,-45,90)s laminates supported in a clamped-clamped/free-free configuration with varying amounts of in-plane load, $N(\text{sub } x)$, applied. Specimens were impacted at energies of 3.4, 4.5, and 6 Joules (2.5, 3.3, and 4.4 ft-lb). The amount of damage induced into the specimen was evaluated using instrumented impact techniques, x-ray inspection, and cross-sectional photomicroscopy. Some static indentation tests were performed to examine if the impact events utilized in this study were of a quasi-static nature and also to gain insight into the shape of the deflected surface at various impact load combinations. Load-displacement curves from these tests were compared to those of the impact tests, as was damage determined from x-ray inspection. The finite element technique was used to model the impact event and determine the stress field within the laminae. Results showed that for a given impact energy level, more damage was induced into the specimen as the external in-plane load, $N(\text{sub } x)$, was increased. The majority of damage observed consisted of back face splitting of the matrix parallel to the fibers in that ply, associated with delaminations emanating from these splits. The analysis showed qualitatively the results of impact conditions on maximum load of impact, maximum transverse deflection, and first failure mode and location.

Author

Epoxy Matrix Composites; Laminates; Impact Tests; Dynamic Tests

19980009349 Colorado Univ., Dept. of Civil Environmental and Architectural Engineering, Boulder, CO USA

Regularization of Localized Degradation Processes Final Report, 1 Aug. 1992 - 31 Jul. 1995

William, Kaspar J., Colorado Univ., USA; Dec. 28, 1996; 15p; In English

Contract(s)/Grant(s): F49620-92-J-0442

Report No.(s): AD-A329668; Rept-153-7208; AFOSR-TR-97-0483; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Localization and the formation of spatial discontinuities indicate the onset of failure in materials which are subjected to degradation from a continuum into a discontinuum. In this project explicit analytical and geometrical Mohr-type envelope methods were developed to determine discontinuous failure modes in elastoplastic softening and elastic damaging materials. These localization results were obtained for classical non-polar continua in order to assess the regularization properties of non-classical micropolar Cosserat continua which feature non-symmetric stress and strain tensors because of the presence of couple-stresses and micro-curvatures. It was shown that micropolar media may only exhibit localized failure in the form of tensile mode I, while shear failure appears only in a distributed form without forming discontinuities.

DTIC

Failure Modes; Discontinuity; Elastoplasticity

19980009526 BDM International, Inc., McLean, VA USA

Axisymmetric Compression of a Mohr-Coulomb Medium with Arbitrary Dilatancy, Including Free-Field Yielding, 10 Jun. 1991 - 15 Dec. 1996

Kendall, David M., BDM International, Inc., USA; Wintergerst, Gary L., BDM International, Inc., USA; Burgess, Danny N., BDM International, Inc., USA; Oct. 01, 1997; 132p; In English

Contract(s)/Grant(s): DNA001-91-C-0092

Report No.(s): AD-A329759; BDM-TR-91-006-001; DSWA-TR-97-5; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A closed-form analytical solution is developed for hole closure and stresses and strains in a Mohr-Coulomb medium surrounding a circular hole and loaded axisymmetrically in plane strain. This solution extends multiple-plastic-zone solutions developed by others to allow arbitrary dilatancy. It also extends the solution to include cases where particular combinations of friction angle, elastic properties, and free-field pressure cause the free field to yield before significant deformation of the opening occurs. Step-by-step procedures for applying the solution and numerical examples are presented.

DTIC

Elastic Properties; Pressure Distribution; Holes (Mechanics)

19980009527 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Performance of Nonlinear Mechanical, Resonant-Shunted Piezoelectric, and Electronic Vibrations Absorbers for Multi-Degree-of-Freedom Structures

Agnes, Gregory S., Department of the Air Force, USA; Sep. 26, 1997; 168p; In English

Report No.(s): AD-A329730; AFIT-97-026D; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Linear vibration absorbers are a valuable tool used to suppress vibrations due to harmonic excitation in structural systems. Limited evaluation of the performance of nonlinear vibration absorbers for nonlinear structures exists in the current literature. The state of the art is extended in this work to vibration absorbers in their three major physical implementations: the mechanical vibration absorber, the inductive-resistive shunted piezoelectric vibration absorber, and the electronic vibration absorber (also denoted a positive position feedback controller). A single, consistent, physically similar model capable of examining the response of all three devices is developed. The performance of vibration absorbers attached to single-degree-of-freedom structures is next examined for performance, robustness, and stability. Perturbation techniques and numerical analysis combine to yield insight into the tuning of nonlinear vibration absorbers for both linear and nonlinear structures. The results both clarify and validate the existing literature on mechanical vibration absorbers. Several new results, including an analytical expression for the suppression region's location and bandwidth and requirements for its robust performance, are derived. Nonlinear multiple-degree-of-freedom structures are next evaluated. The theory of Non-linear Normal Modes is extended to include consideration of modal damping, excitation and small linear coupling, allowing estimation of vibration absorber performance. The dynamics of the N+1-degree-of-freedom system reduce to those of a two-degree-of-freedom system on a four-dimensional nonlinear modal manifold, thereby simplifying the analysis. Quantitative agreement is shown to require a higher order model which is recommended for future investigation.

DTIC

Vibration Isolators; Absorbers (Equipment); Nonlinearity; Piezoelectricity

19980009532 Texas Univ., Research Center for Mechanics of Solids, Structures and Materials, Austin, TX USA

The Role of Instabilities on the Mechanical Response of Cellular Solids and Structures Final Report, Feb. 1995 - Jan. 1997

Kyriakides, S., Texas Univ., USA; Aug. 31, 1997; 7p; In English

Contract(s)/Grant(s): F49620-95-0154

Report No.(s): AD-A329781; MSS/M-97-15; AFOSR-TR-97-0348; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The project dealt with the in-plane crushing of aluminum honeycombs with hexagonal cells and polymeric honeycombs with circular cells. The relatively regular and periodic microstructure of these two-dimensional materials makes them excellent models for studying the mechanisms that govern the compressive response of cellular materials. Under displacement-controlled loading, the load-displacement response of such materials consists of a relatively sharp initial rise to a load maximum followed by an extended load plateau which is terminated by a sharp rise in load. It has been shown that these characteristics are associated with inelastic buckling and a localization process in which only a narrow zone of cells experiences collapse at any given time. The collapse spreads in a steady-state fashion until all the material is affected. The crushing processes have been simulated numerically by modeling appropriately the underlying nonlinearities of geometry, material and contact. Aluminum was modeled as an elastic-plastic solid and the polycarbonate as an elastic-powerlaw viscoplastic solid. Results from analyses involving characteristic 'cells' and from large scale simulations of crushing have been produced. Both are in very good agreement with the experimental results. The numerical models were also used to conduct parametric studies of the mechanical properties of these two types of honeycombs. The methods developed are currently being extended to the three-dimensional setting to enable similar parametric studies of foams.

DTIC

Aluminum; Buckling; Collapse; Compressibility; Crushing; Displacement; Hexagonal Cells; Loads (Forces); Mechanical Properties; Microstructure; Polycarbonates

19980009765 Sandia National Labs., Albuquerque, NM USA

Elastic shock response and spall strength of concrete

Kipp, M. E., Sandia National Labs., USA; Chhabildas, L. C., Sandia National Labs., USA; Reinhart, W. D., Sandia National Labs., USA; 1997; 4p; In English; Meeting of the Topical Group on Shock Compression of Condensed Matter of the American Physical Society, 27 Jul. - 1 Aug. 1997, Amherst, MA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-0464C; CONF-970707-1; DE97-007910; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Impact experiments have been performed to obtain shock compression, release response, and spall strength of two scaled concrete formulations. Wave profiles from a suite of ten experiments, with shock amplitudes of 0.08 to 0.55 GPa, focus primarily on the elastic regime. Despite considerable wave structure that develops at the shock transits these heterogeneous targets, consistent pullback signals were identified in the release profiles, indicating a spall strength of about 30 MPa. Explicit modeling of the concrete aggregate structure in numerical simulations provides insight into the particle velocity records.

DOE

Concrete Structures; Impact Tests; Concretes

19980010010 Technische Univ., Faculty of Aerospace Engineering, Delft, Netherlands

Imperfections Measurement of Shell Liupf02, Liup01 and Liup02

Gunawan, L., Technische Univ., Netherlands; Jun. 1997; 41p; In English

Report No.(s): PB97-204671; MEMO-M-800; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Imperfection measurement were carried out on three shells out of a series of four which were specially manufactured to be used as specimens in nonlinear vibration tests. Two of them were designed as perfect shells and the other two as shells with axisymmetric imperfections. This report presents the results of the imperfection measurements on the second perfect shell and the two imperfect shells. The results show indeed that first shell is practically perfect and the other two have a dominant axisymmetric imperfection. The imperfection coefficients of the perfect shell are small, typically less than 0.14 wall thickness for circumferential wave numbers less than 10, and less than 0.02 wall thickness for circumferential wave number more than 10.

NTIS

Vibration Tests; Cylindrical Shells; Defects

19980010434 Purdue Univ., School of Aeronautics and Astronautics, West Lafayette, IN USA

Materials Degradation and Fatigue in Aerospace Structures Final Report, 1 Jul. 1993 - 30 Jun. 1997

Grandt, A. F., Jr., Purdue Univ., USA; Aug. 1997; 331p; In English

Contract(s)/Grant(s): F49620-93-I-0377

Report No.(s): AD-A329663; AFOSR-TR-97-0449; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This report summarizes research conducted by the Purdue University Schools of Engineering and Science during a four year AFOSR University Research Initiative focused on basic issues dealing with aging aircraft. The coordinated goals of the program fall into four main categories: damage development, prediction of crack growth and interaction failure prevention techniques, and advanced analysis methods. The damage development goals addressed the failure mechanisms of corrosion, fatigue crack formation, and fretting. The general objective of the crack growth and interaction tasks was to develop techniques to predict the growth of service induced cracks and to determine the impact of widespread cracking on damage tolerance. The theme of the failure prevention projects was to develop procedures to extend the operational life of older aircraft by delaying service induced damage, repairing cracked structure, and employing fleet tracking methods to prioritize maintenance actions within a fleet of aircraft. Finally, research was directed at developing advanced analysis methods used in other research tasks. These projects dealt with adding statistical components to various materials evaluations and structural analyses, and developing ductile fracture criteria relative to aircraft materials and structures.

DTIC

Aircraft Structures; Fatigue Life; Aircraft Maintenance; Commercial Aircraft; Military Aircraft

19980010494 NASA Langley Research Center, Hampton, VA USA

Government-Sponsored Programs on Structures Technology

Noor, Ahmed K., Compiler, Virginia Univ., USA; Malone, John B., Compiler, NASA Langley Research Center, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997; 290p; In English; Proceedings of Workshops, 6 Apr. 1997, Kis-

simmee, FL, Hampton, VA, USA, USA; Sponsored by NASA Washington, USA; Also announced as 19980010495 through 19980010507

Contract(s)/Grant(s): RTOP 522-31-21-33

Report No.(s): NASA/CP-97-206241; NAS 1.55:206241; L-17670; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This document contains the presentations from the joint UVA/AIAA workshops on Government-Sponsored Programs on Structures Technology, held on April 6, 1997 in Kissimmee, Florida and on September 4, 1997 in Hampton, Virginia. Workshop attendees were the Members and Friends of the AIAA Structures Technical Committee. The objectives of the workshops were to: (a) provide a forum for discussion of current government-sponsored programs in the structures area; (b) identify high-potential research areas for future aerospace systems; and (c) initiate suitable interaction mechanisms with the managers of structures programs.

Author

Aerospace Systems; Government/Industry Relations; Research and Development; Technology Transfer; Conferences; Spacecraft Structures; Aircraft Structures; Smart Structures

19980010495 NASA Langley Research Center, Hampton, VA USA

Airframe Systems: Research and Technology Base Program

Whitlow, Woodrow, Jr., NASA Langley Research Center, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 19-40; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The author argues that the aeronautics research and technology base has shifted from a discipline focus to a program focus. The program planning is progressing as Level I is complete and Level II plans are under development, while there is significant inter-center planning and coordination taking place. These programs are addressing problems that are important to the nation namely, "the three pillars to success" which are; access to space, global civil aviation and revolutionary technology leaps.

CASI

Coordination; Project Planning; Research and Development; Project Management; Government/Industry Relations; Airframes; NASA Programs

19980010496 NASA Lewis Research Center, Cleveland, OH USA

An Overview-NASA LeRC Structures Program

Zaretsky, Erwin V., NASA Lewis Research Center, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 41-73; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Structures and Acoustics Division of the NASA Lewis Research Center has its genesis dating back to 1943. It has been an independent Division at Lewis since 1979. Its two primary capabilities are performance and life analysis of static and dynamic systems such as those found in aircraft and spacecraft propulsion systems and experimental verification of these analyses. Research is conducted in-house, through university grants and contracts, and through cooperative programs with industry. Our work directly supports NASA's Advanced Subsonic Technology (AST), Smart Green Engine, Fast Quiet Engine, High-Temperature Materials and Processing (HiTEMP), Hybrid Hypersonic Propulsion, Rotorcraft, High-Speed Research (HSR), and Aviation Safety Program (AvSP). A general overview is given discussing these programs and other technologies that are being developed at NASA LeRC.

Derived from text

General Overviews; Research and Development; Technology Assessment; Technology Utilization; NASA Programs; Aircraft Structures; Spacecraft Structures

19980010497 NASA Ames Research Center, Moffett Field, CA USA

Habitats and Surface Construction Technology and Development Roadmap

Cohen, Marc, NASA Ames Research Center, USA; Kennedy, Kriss J., NASA Johnson Space Center, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 75-96; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The vision of the technology and development teams at NASA Ames and Johnson Research Centers is to provide the capability for automated delivery and emplacement of habitats and surface facilities. The benefits of the program are as follows: Composites and Inflatables: 30-50% (goal) lighter than Al Hard Structures; Capability for Increased Habitable Volume, Launch Efficiency; Long Term Growth Potential; and Supports initiation of commercial and industrial expansion. Key Habitats and Surface Construction (H&SC) technology issues are: Habitat Shell Structural Materials; Seals and Mechanisms; Construction and

Assembly: Automated Pro-Deploy Construction Systems; ISRU SOIL/Construction Equipment: Lightweight and Lower Power Needs; Radiation Protection (Health and Human Performance Tech.); Life Support System (Regenerative Life Support System Tech.); Human Physiology of Long Duration Space Flight (Health and Human Performance Tech.); and Human Psychology of Long Duration Space Flight (Health and Human Performance Tech.) What is being done regarding these issues?: Use of composite materials for X-38 CRV, RLV, etc.; TransHAB inflatable habitat design/development; Japanese corporations working on ISRU-derived construction processes. What needs to be done for the 2004 Go Decision?: Characterize Mars Environmental Conditions: Civil Engineering, Material Durability, etc.; Determine Credibility of Inflatable Structures for Human Habitation; and Determine Seal Technology for Mechanisms and Hatches, Life Cycle, and Durability. An overview encompassing all of the issues above is presented.

CASI

Habitats; Construction; Research and Development; Mars Exploration; NASA Programs; Technology Assessment; Technological Forecasting; Technology Utilization

19980010498 Department of the Air Force, Flight Dynamics Directorate, Wright-Patterson AFB, OH USA

Structures Technology Development

Paul, Donald B., Department of the Air Force, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 97-140; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The Flight Dynamics Directorate develops Air Force structures technology by integrating new or state-of-the-art technologies in design requirements, manufacturing techniques, materials, and processes with requirements for propulsion, flight controls, aeromechanics, low observables, subsystems, weapons and avionics. The results are advanced structural concepts and design methods for new and improved aerospace vehicles (FATE & TAFT). A general overview of the topics above is presented.

CASI

Aerodynamics; General Overviews; Flight Mechanics; Research and Development

19980010499 Department of the Air Force, Office of Scientific Research, Washington, DC USA

Structures TC Goals/Responsibility/Opportunity and AFOSR

Chang, Jim C. I., Department of the Air Force, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 141-157; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A general overview of the Air Force Office of Scientific Research (AFOSR) activities is presented. The organizational structure, investments, research strategies, future plans, responsibilities, etc. of the AFOSR as they relate to research and development are discussed. Goals and recommendations for the future are also included.

CASI

General Overviews; Research Projects; Research and Development; Technology Assessment; Organizations

19980010500 Department of the Air Force, Office of Scientific Research, Washington, DC USA

Structural Mechanics

Sanders, Brian P., Department of the Air Force, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 159-172; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The paper gives a broad overview of Structural Mechanics and its treatment at the Air Force Office of Scientific Research (AFOSR). In particular, programmatic issues, a subarea review, the UAV Program, a summary and future plans are outlined. Among topics discussed are fluid-structure interaction, deformation control for enhancing vehicle performance, smart composite structures, higher order theory laminates, and material mechanics.

CASI

Research and Development; Government/Industry Relations; Technological Forecasting; Technology Assessment; General Overviews

19980010501 Advanced Research Projects Agency, Arlington, VA USA

The DARPA Smart Materials and Structures Program

Crowe, C. Robert, Advanced Research Projects Agency, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 173-183; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

An overview of the Defense Advanced Research Projects Agency's (DARPA's) Smart Materials and Structures Program is presented. Objectives, funding, project reviews such as shape adaptive structures, smart wing and structures development and manufacturing issues are discussed.

CASI

Smart Structures; Aircraft Structures; Actuators; Sensors; Manufacturing

19980010502 Army Research Office, Research Triangle Park, NC USA

Structural Dynamics Program

Anderson, Gary L., Army Research Office, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 185-199; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

A general overview of the structural dynamics program at the Army Research Office (ARO) is presented. Topics include: Land vehicle and multibody dynamics; structural damping; smart structures and structural control; statics and dynamics of inflatable structures; integrated aeromechanics analysis; rotorcraft numerical analysis; projectile aeroelasticity; dynamic control systems for projectiles and parachute inflation aeromechanics.

CASI

Dynamic Structural Analysis; General Overviews; Aerodynamics; Armed Forces (USA); Military Technology

19980010503 Office of Naval Research, Ship Structures and Systems Div., Arlington, VA USA

Solid Mechanics Program

Barsoum, Roshdy George S., Office of Naval Research, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 201-207; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

A general overview of the Solid Mechanics Program at the Office of Naval Research (ONR) is presented. Topics include: Structural reliability of ships; reliability of power electronic building blocks; active materials and adaptive structures; reliability of complex structural systems; mechanics of structural materials; and computational methods and prototype simulation.

CASI

General Overviews; Solid Mechanics; Structural Reliability; Military Technology

19980010504 Federal Aviation Administration, Atlantic City, NJ USA

Overview of FAA Structural Integrity Program for Large Transport Aircraft

Tan, Paul W., Federal Aviation Administration, USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 209-235; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

On April 28, 1988, multiple fatigue cracks caused an Aloha Airlines Boeing 737-200 aircraft to lose part of its upper fuselage. Although the aircraft was able to land safely, the accident resulted in the death of one flight attendant and injury to many passengers. The aircraft, which entered service in April 1969, had accumulated 35,496 hours and 89,690 flight cycles. Less than five weeks after the Aloha Airlines accident, the FAA convened an international conference to discuss the issue of aging aircraft in the world-wide fleet. of particular concern was the fact that many airplanes were approaching or had exceeded the manufacturers' design operational life. The conference included operations, maintenance, manufacturing and regulatory representatives. A general consensus was reached that, with proper maintenance and structural modifications and with attention to service-related damage such as fatigue and corrosion, the design operational lives of airplanes could be safely exceeded. The resulting issues, initiatives and recommendations later became the basis for the FAA's National Aging Aircraft Research Program (NAARP). The NAARP is a multidisciplinary program and this overview of one sub-program covers the research in the structural integrity of large transport aircraft (SITA). There are three major elements within this sub-program: (a) methodologies to predict the onset of widespread fatigue damage, (b) structural integrity of repairs, and (c) probabilistic methodologies for widespread fatigue damage.

Derived from text

Civil Aviation; Commercial Aircraft; Fatigue (Materials); Structural Failure; Transport Aircraft; Fatigue Life; Damage Assessment

19980010505 Sandia National Labs., Albuquerque, NM USA

Overview of Research, Development and Application Activities at Sandia National Laboratory

Hommert, Paul J., Sandia National Labs., USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 237-278; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Topics covered in the overview include: nuclear weapons safety; engineering simulation; modeling and simulation based life cycle engineering; the ASCI supercomputer; high performance computing research; material mechanics; finite element code

development; structural dynamics; solid mechanics; atomistic, microstructure and continuum material modeling; damage and failure of metals; optimization and failure analysis; and uncertainty quantification.

CASI

Research and Development; Technology Utilization; General Overviews

19980010506 Lawrence Livermore National Lab., Defense Technologies Engineering Div., Livermore, CA USA

Structural Mechanics Code Development at Lawrence Livermore National Laboratory

Raboin, Peter J., Lawrence Livermore National Lab., USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 279-291; In English; Also announced as 19980010494

Contract(s)/Grant(s): W-7405-eng-48; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

Lawrence Livermore National Laboratory has developed a unique set of finite element codes for solving structural mechanics problems for Laboratory programs, specifically the Weapons and Lasers programs. Going back twenty years, these codes have developed into a family of explicit and implicit finite element codes called DYNA and NIKE. The TOPAZ code is our implicit heat transfer code and it is integrated with the DYNA and NIKE codes. The Methods Development Group is responsible for the development of these codes and supports the sixty or so analysts who use these codes daily. New SMP and MPP computers are coming into use at our Lab and we have reason to be very optimistic about the increased modeling capabilities that improved computer speeds provide. New code capabilities however are driven by the need to solve problems presented by our program analysts. A general overview of the above topics is presented.

Derived from text

General Overviews; Structural Analysis; Finite Element Method; Research and Development; Applications Programs (Computers)

19980010507 General Electric Co., Aircraft Engines, Cincinnati, OH USA

Aircraft Engine Materials: Recent Trends and Future Directions

Williams, Jim C., General Electric Co., USA; Government-Sponsored Programs on Structures Technology; Nov. 1997, pp. 293-306; In English; Also announced as 19980010494; No Copyright; Avail: CASI; A03, Hardcopy; A03, Microfiche

The general overview includes an introduction to aircraft engine materials; an engine performance discussion; the role of materials in engine design, i.e. disks and airfoils; a summary and future directions in aircraft engines.

CASI

Aircraft Engines; Engine Design; Research and Development; Technology Assessment

19980010619 California Univ., Dept. of Mechanical and Environmental Engineering, Santa Barbara, CA USA

Characterization of Joint Nonlinear Stiffness and Damping Behavior for Inverse Dynamics of Flexible Articulated Structures Final Report, 15 Aug. 1993 - 14 Aug. 1996

Paden, Brad, California Univ., USA; Trautt, Thomas A., California Univ., USA; Aug. 14, 1996; 10p; In English

Contract(s)/Grant(s): F49620-93-I-0462

Report No.(s): AD-A330608; AFOSR-TR-97-0536; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

An inverse dynamics algorithm is derived for active vibration quenching of structures. The algorithm uses frequency domain techniques to compute an input function needed to produce a desired response at a particular degree of freedom. The desired response is a transition from the initial vibrating condition to a non-vibration condition. The algorithm can also be used to modify the input function to correct for system disturbances while the input function is already being applied to the system. The algorithm is demonstrated in a simulation of a simply supported beam controlled by a torque actuator at one end of the beam. The finite element method is used to discretized the equations of motion of the beam.

DTIC

Degrees of Freedom; Dynamic Response; Dynamic Structural Analysis; Equations of Motion; Finite Element Method; Nonlinear Systems

19980010755 Los Alamos National Lab., NM USA

Experiments Showing Dynamics of Material Interfaces

Benjamin, Robert F., Los Alamos National Lab., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 211-217; In English; Also announced as 19980010742

Report No.(s): LA-UR-97-201; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The discipline of materials science and engineering often involves understanding and controlling properties of interfaces. We address the challenge of educating students about properties of interfaces, particularly dynamic properties and effects of unstable

interfaces. A series of simple, inexpensive, hands-on activities about fluid interfaces provides students with a testbed to develop intuition about interface dynamics. The experiments highlight the essential role of initial interfacial perturbations in determining the dynamic response of the interface. The experiments produce dramatic, unexpected effects when initial perturbations are controlled and inhibited. These activities help students to develop insight about unstable interfaces that can be applied to analogous problems in materials science and engineering.

Author

Dynamic Characteristics; Dynamic Response; Interface Stability; Experimentation; Liquid-Liquid Interfaces; Liquid-Solid Interfaces

19980010765 Saint Lawrence Univ., Physics Dept., Canton, NY USA

Relaxation and Resistance Measurement

Koon, Daniel W., Saint Lawrence Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 297-305; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

Electrical resistivity measurement is a cheap atomic microscope. This measurement allows one to 'see' the individual charge carriers through their interaction with the surrounding atoms. If one simultaneously measures resistivity and another electrical quantity, the Hall effect, one can calculate the density, mobility, and the sign of the charge carriers, all microscopic quantities.

Derived from text

Electrical Resistivity; Numerical Analysis; Laplace Equation; Hall Effect; Charge Carriers

19980010766 San Jose State Univ., Dept. of Materials Engineering, CA USA

The Effect of Surface Finish on Tensile Strength

Chao, Julie, San Jose State Univ., USA; Currotto, Selene, San Jose State Univ., USA; Anderson, Cameron, San Jose State Univ., USA; Selvaduray, Guna, San Jose State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 307-324; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Mechanical testing of materials is generally performed for reasons such as product and material development, design or quality control. It is performed for materials development in order to define the specifications of the material. For design, it is performed in order to create or select materials for specific applications. In quality control, it is done to verify that the incoming material meets specifications. Uniaxial tensile testing is one of the most widely and frequently performed tests. This test involves the gripping of a specimen at both ends and subjecting it to increasing axial load until it breaks. The tensile strength of a material may be measured in terms of either the stress necessary to cause a significant amount of plastic deformation or the maximum stress that the material can withstand.

Derived from text

Mechanical Properties; Tensile Strength; Surface Finishing; Axial Loads; Plastic Deformation

19980010777 College of Western New England, Mechanical Engineering, Springfield, MA USA

Holy Holes or Holes Can Make Tensile Struts Stronger

Karplus, Alan K., College of Western New England, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 447-454; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

This empirical experiment presents the reaction of a selected material to a tensile load as cross section geometry changes while maintaining constant cross section area. This makes for some fascinating discoveries. The more and smaller the holes, the "stronger" the strut! The objective of this work is to show that increasing the number of uniformly sized, equally spaced holes and adjusting the hole size across a face to keep a constant cross section area increases the load carrying capacity of a tensile strut for some materials. This understanding can assist the designer and student in using materials more wisely, especially when placing holes in a member for weight reduction.

Derived from text

Tensile Strength; Stress Concentration; Holes (Mechanics); Struts

19980011579 Virginia Transportation Research Council, Charlottesville, VA USA

Investigation of Delayed Cracking in Pivot Steel Box Girders Final Report, Apr. 1996 - Jun. 1997

Lozev, M. G., Virginia Transportation Research Council, USA; Washer, G. A., Federal Highway Administration, USA; Wright, W. J., Federal Highway Administration, USA; Jun. 1997; 181p; In English
Report No.(s): PB97-180079; VTRC-97-R18; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The report describes the results of an investigation to find the cause of the delayed cracking in the welds of the fracture-critical steel pivot box girders fabricated for the George P. Coleman Bridge. Through the use of different nondestructive methods, more than 200 transverse and longitudinal cracks were found. The possibility of unique, rare, and very long-term delayed cracking (cold or hydrogen-induced cracking) was supported by the results of the hydrogen content analysis, residual stress measurements, and macro-microstructural metallography and fractography. There was strong evidence that a susceptibility to hydrogen-induced cracking of the weld metal in the north girder developed during fabrication and that this susceptibility, the presence of hydrogen in the weld and base metal, and residual stresses combined to cause cracking to occur. The great number of cracks detected in the welds of the north girder, coupled with the very large total crack lengths, demonstrated that these welds have been and still are inordinately susceptible to cold cracking. Calculations showed that brittle fracture could occur in the partial penetration groove weld under the worst conditions, but this is not probable. Calculations also showed that there is little probability that the cracks will extend in any significant amount because of fatigue during the life of the bridge. The author recommends that the north box girder be inspected by magnetic particle testing or eddy current testing at least every 6 months for the next 3 years and that cracks be repaired when found.

NTIS

Welded Joints; Fracturing; Cracks; Failure Analysis; Cracking (Fracturing); Bridges (Structures); Nondestructive Tests; Crack Propagation

19980011993 National Physical Lab., Teddington, UK

Flexural Strength Testing of Ceramics and Hardmetals: Measurement Good Practice Guide

Morrell, R., National Physical Lab., UK; Sep. 1997; 80p; In English

Report No.(s): PB98-111248; NPL-MGPG-7; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This guide is intended to aid the establishment of good practice in flexural testing of beam test-pieces of non-ductile materials, especially ceramics and hardmetals, whether or not it is performed in accordance with standardized procedures. There is discussion of the different purposes behind undertaking flexural testing and the influence this may have on choice of procedure. A summary of Weibull statistical analysis is given, together with some of the pitfalls in using the derived information for design purposes. Background information is provided to explain why the practices and test-piece geometries and tolerances have been adopted in standards. There is guidance on what the important factors are in interpreting the results of flexural testing, including fractographic investigation. The mathematical basis for analyzing the stress errors in non-standard tests when assuming simple thin-beam bending equations is presented. This guide will have value to those considering commissioning, setting up to perform, or undertaking flexural testing, as well as to those using the results from series of tests.

NTIS

Flexural Strength; Ceramics; Metals; Statistical Analysis

42

GEOSCIENCES (GENERAL)

19980009256 Texas A&M Univ., Geochemical and Environmental Research Group, College Station, TX USA

Chemosynthetic Ecosystems Study, Volume 3, Appendices

MacDonald, I. R., Texas A&M Univ., USA; Sager, W. W., Texas A&M Univ., USA; Lee, C., Texas A&M Univ., USA; Schroeder, W. W., Texas A&M Univ., USA; Kennicutt, M. C., Texas A&M Univ., USA; Jun. 1995; 271p; In English

Contract(s)/Grant(s): MMS-14-35-0001-30555

Report No.(s): PB96-185806; OCS-Study-MMS-95-0023; TAMRF-6899; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Volume III presents ancillary materials from the findings of a three year investigation of the geology, chemistry and biology of chemosynthetic ecosystems in the Gulf of Mexico. These dense assemblages of tube worms, mussels and/or clams are primarily dependent upon chemical conditions generated by natural oil and gas seeps. Hydrocarbon seeps produce a variety of distinctive geological features including carbonate rock, mud volcanoes and hydrate mounds, which tend to be localized to areas less than 1 km. The interaction of the sediment bacteria with the hydrocarbons in the seafloor yields a highly specialized chemical environment featuring high levels of hydrogen sulfide and degraded oils. The biological community is supported by chemoautotrophic bacteria that live symbiotically with tube worms, mussels and clams.

NTIS

Ecosystems; Gulf of Mexico; Mollusks; Biogeochemistry; Shellfish; Crude Oil

19980009348 Texas A&M Univ., Geochemical and Environmental Research Group, College Station, TX USA

Northern Gulf of Mexico: Chemosynthetic Ecosystems Study, Volume 2, Technical Report *Final Report*

MacDonald, I. R., Texas A&M Univ., USA; Sager, W. W., Texas A&M Univ., USA; Lee, C., Texas A&M Univ., USA; Schroeder, W. W., Texas A&M Univ., USA; Kennicutt, M. C., Texas A&M Univ., USA; Jun. 1995; 336p; In English

Contract(s)/Grant(s): MMS-14-35-0001-30555

Report No.(s): PB96-185798; OCS-Study-MMS-95-0022; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Volume II presents detailed findings of a three year investigation of the geology, chemistry and biology of chemosynthetic ecosystems in the Gulf of Mexico. These dense assemblages of tube worms, mussels and/or clams are primarily dependent upon chemical conditions generated by natural oil and gas seeps. Hydrocarbon seeps produce a variety of distinctive geological features including carbonate rock, mud volcanoes and hydrate mounds, which tend to be localized to areas less than 1 km. The interaction of the sediment bacteria with the hydrocarbons in the seafloor yields a highly specialized chemical environment featuring high levels of hydrogen sulfide and degraded oils. The biological community is supported by chemoautotrophic bacteria that live symbiotically with tube worms, mussels and clams. The bacteria derive energy for fixing new carbon by oxidizing sulfides or methane.

NTIS

Ecosystems; Biogeochemistry; Mollusks; Shellfish; Crude Oil; Gulf of Mexico

19980009401 NASA Goddard Space Flight Center, Greenbelt, MD USA

Two Reduced Resolution Filter Approaches to Data Assimilation

Todling, Ricardo, NASA Goddard Space Flight Center, USA; Cohn, Stephen E., Universities Space Research Association, USA; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1069-1072; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

In this paper we evaluate the performance of two reduced resolution filter approaches to data assimilation. The main distinction between these approaches is in the manner they propagate error covariances. Both account for error covariances in a space with dimension m smaller than the model's state vector dimension n . In the first approach the m dimensional error covariance matrix is interpolated to the n -dimensional space and propagated with the n -dimensional dynamics. In the second approach the low-dimensional error covariance matrix is propagated by a dynamical operator generated in the m -dimensional space. Our experiments indicate that the first approach provides a more reliable simplified scheme for error covariance propagation than the second approach.

Author

Assimilation; Covariance; State Vectors; Interpolation; Error Analysis; Data Processing

19980009776 California Univ., Earth Science Board, Santa Cruz, CA USA

Calibration of Regional Wave Discriminants in Diverse Geological Environments: Topographic Correlations *Final Report, 1 May 1994 - 30 Apr. 1997*

Lay, Thorne, California Univ., USA; Sep. 12, 1997; 43p; In English

Contract(s)/Grant(s): F49620-94-I-0247

Report No.(s): AD-A332499; AFOSR-TR-97-0636; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This is the final report for this grant to explore waveguide effects on high frequency regional signals. Three studies are presented. The first is a theoretical investigation of the effects of thin crustal structure on Lg propagation. This study demonstrates that standard Lg in the frequency band 0.3 to 2 Hz does not develop in crustal structures less than 10 km thick due to a lack of overtone energy. This is the primary explanation for why oceanic crust blocks Lg phases in this frequency band. A second study demonstrates that surface topography variations are correlated with Pg/Lg amplitude ratios for frequencies less than 3 Hz, using broadband observations in the western U.S. Optimal variance reduction of Pg/Lg amplitude ratio measurements (a common seismic discriminant), are achieved by using empirical relationships with propagation distance and roughness. Pn/Lg data show less sensitivity to surface topography variations, but strong distance dependence. The third study demonstrates the complexity of high frequency wavefields in tectonically active regions, using a very dense short period array deployed in the Santa Cruz Mountains area. Large apparent back-azimuth deflections, of up to 60 degrees, are found for P wave particle motions and f-k measurements, and appear to be the result of shallow dipping layers under the array. Spatial coherence of the high frequency wavefield exhibits strong decreases with frequency and sensor offset.

DTIC

Seismic Waves; Surface Roughness; Topography; Correlation

19980010585 Rutherford Appleton Lab., Chilton, UK

Geophysics Including Meteorology, Ionospheric Physics, Space Physics, Geochemistry, Seismology, Paleo Magnetism, Plate Tectonics Part II Hydrology, Oceans, Atmosphere & Nonlinear Geophysics, Supplement II to Volume 15, Part 2, Hydrology, Oceans, Atmosphere and Nonlinear Geophysics

May 20, 1997; 371p; In English; 22nd; European Geophysical Society General Assembly, 21-25 Apr. 1997

Contract(s)/Grant(s): F61708-97-W-0116

Report No.(s): AD-A330726; EOARD-CSP-97-1048-Pt-2-Suppl-2; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The Final Proceedings for European Geophysical Society 22 General Assembly, 21 April 1997 - 25 April 1997 The Topics covered include: Geophysics including meteorology, ionospheric physics, space physics, geochemistry seismology, paleo magnetism, plate tectonics.

DTIC

Atmospheric Physics; Conferences; Geochemistry; Geophysics; Hydrology

19980010586 Rutherford Appleton Lab., Chilton, UK

Geophysics Including Meteorology, Ionospheric Physics, Space Physics, Geochemistry, Seismology, Paleo Magnetism, Plate Tectonics, Part 3, Space and Planetary Sciences

May 20, 1997; 228p; In English; 22nd; European Geophysical Society General Assembly, 21-25 Apr. 1997

Contract(s)/Grant(s): F61708-97-W-0116

Report No.(s): AD-A330725; EOARD-CSP-97-1048-Pt-3-Suppl-3; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

The Final Proceedings for European Geophysical Society XXII General Assembly, 21 April 1997 - 25 April 1997 The Topics covered include: Geophysics including meteorology, ionospheric physics, space physics, geochemistry seismology, paleo magnetism, plate tectonics.

DTIC

Atmospheric Physics; Geochemistry; Geophysics; Magnetic Properties

19980010874 Atmospheric and Environmental Research, Inc., Cambridge, MA USA

Advanced Geophysical Environment Simulation Techniques Topical Report No. 2

Gustafson, G. B., Atmospheric and Environmental Research, Inc., USA; dEntremont, R. P., Atmospheric and Environmental Research, Inc., USA; Ivaldi, C. F., Atmospheric and Environmental Research, Inc., USA; Beresford, S. T., Atmospheric and Environmental Research, Inc., USA; Sarkisian, C. P., Atmospheric and Environmental Research, Inc., USA; Dec. 01, 1996; 57p; In English

Contract(s)/Grant(s): F19628-94-C-0106; AF Proj. 7659

Report No.(s): AD-A331437; PL-TR-96-2306; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This interim scientific report describes a multi-faceted effort to support PL/GPD in the development and application of state-of-the-art analysis techniques for remotely sensed data. The resulting tools, techniques and data sets will support the improved analysis of archived data as well as current and future geophysical parameter acquisition and analysis. The principal accomplishments during the reporting period were: development of improved algorithms for retrieval of cirrus emissivity and estimation of cloud altitude; development of improved cloud-phase discrimination algorithms for analysis of GOES imager and AVHRR data; application of existing cloud detection and new cloud-phase and emissivity algorithms to a two-month data set collected from one GOES and two NOAA satellites over the eastern and central portions of the continental U.S. and western Atlantic; reduction and quality assurance processing of approximately one month of raw radiosonde data from five sites; and software tool and technique development for enhanced satellite image processing capabilities on the Air Force Interactive Meteorological System.

DTIC

Advanced Very High Resolution Radiometer; Discriminant Analysis (Statistics); Environment Simulation; Geophysics; Image Processing; Radiosondes; Remote Sensing; Satellite Imagery

19980010899 Naval Postgraduate School, Monterey, CA USA

Deep Mixed Layer Entrainment

Stone, Rebecca E., Naval Postgraduate School, USA; Mar. 1997; 78p; In English

Report No.(s): AD-A331956; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A bulk turbulence-closure mixed layer model is generalized to allow prediction of very deep polar sea mixing. The model includes unsteady three-component turbulent kinetic energy budgets. In addition to terms for shear production, pressure redis-

tribution, and dissipation, special attention is devoted to realistic treatment of thermobaric enhancement of buoyancy flux and to Coriolis effect on turbulence. The model is initialized and verified with CTD data taken by R/V Valdivia in the Greenland Sea during winter 1993-1994. Model simulations show (1) mixed layer deepening is significantly enhanced when the thermal expansion coefficient's increase with pressure is included; (2) entrainment rate is sensitive to the direction of wind stress because of Coriolis; and (3) the predicted mixed layer depth evolution agrees qualitatively with the observations. Results demonstrate the importance of water column initial conditions, accurate representation of strong surface cooling events, and inclusion of the thermobaric effect on buoyancy, to determine the depth of mixing and ultimately the heat and salt flux into the deep ocean. Since coupling of the ocean to the atmosphere through deep mixed layers in polar regions is fundamental to our climate system, it is important that regional and global models be developed that incorporate realistic representation of this coupling.

DTIC

Ocean Surface; Data Acquisition; Ocean Bottom; Polar Regions

19980011636 National Biological Service, Onalaska, WI USA

Long Term Resource Monitoring Program Standard Operating Procedures: Aquatic Areas Database Production

Owens, T., National Biological Service, USA; Rusher, J. J., Wisconsin Univ., USA; Mar. 1996; 10p; In English

Report No.(s): PB96-172267; LTRMP-95-P008-6; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This chapter describes specific procedures that are to be followed by Long Term Resource Monitoring Program (LTRMP) staff when creating aquatic areas coverages. This procedure uses data already created for the land cover/use coverage for the pool. The procedures are divided into several steps: (1) delineation of the main channel, (2) digitizing the main channel and structures, (3) dissolving the land cover data into aquatic and nonaquatic classes, (4) on-screen digitizing and classification, (5) completing the attribute tables photointerpretation, and (6) placing the coverages in the database. The aquatic areas classification is appended.

NTIS

Data Bases; Land Use; Waterways; Classifications; Delineation

43

EARTH RESOURCES AND REMOTE SENSING

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography. For instrumentation see 35 Instrumentation and Photography.

19980009135 Geological Survey, Water Resources Div., Cheyenne, WY USA

Water Resources Data for Wyoming, Water Year 1995 Annual Report, Oct. 1994 - Sep. 1995

Smalley, M. L., Geological Survey, USA; Woodruff, R. E., Geological Survey, USA; Clark, M. L., Geological Survey, USA; McCollam, P. B., Geological Survey, USA; May 1995; 466p; In English

Report No.(s): PB96-188115; USGS/WRD/HD-96/246; USGS-WDR-WY-95-1; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

Water resources data for the 1995 water year for Wyoming consists of records of stage, discharge and water quality of streams; and stage and contents of lakes and reservoirs, and water levels and water quality of ground water. This report contains discharge records for 186 gaging stations; and stage and contents for 16 lakes and reservoirs; water quality for 34 gaging stations and 22 ungaged stations; and water levels for 7 observation wells. Additional water data were collected at various sites, not part of the systematic data collection program, and are published as miscellaneous measurements.

NTIS

Ground Water; Water Resources; Surface Water; Water Quality; Geological Surveys; Hydrology

19980009152 Geological Survey, Water Resources Div., Raleigh, NC USA

Water Resources Data for North Carolina, Water Year 1995, Volume 2, Ground-Water Records Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Smith, D. G., Geological Survey, USA; George, E. D., Geological Survey, USA; Breton, P. L., Geological Survey, USA; Jun. 01, 1996; 286p; In English

Report No.(s): PB96-188248; USGS-WDR-NC-95-2; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Water-resources data for the 1995 water year for North Carolina consist of records of ground-water levels and water quality of ground water; records of stage, discharge, and water quality of streams; and stage and contents of lakes and reservoirs. This report contains ground-water level data from 81 observation wells and ground-water quality data from 125 wells.

NTIS

Ground Water; Water Resources; Surface Water; Geological Surveys; Hydrology

19980009249 Geological Survey, Water Resources Div., Tallahassee, FL USA

Water Resources Data for Florida, Water Year 1995, Volume 2A, South florida Surface Water Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Price, C., Geological Survey, USA; Murray, M., Geological Survey, USA; May 30, 1996; 343p; In English
Report No.(s): PB96-188677; USGS/WDR/FL-95/2A; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

The data for South Florida included continuous or daily discharge for 73 streams, continuous or daily stage for 76 streams, peak stage discharge for no streams, continuous elevation for 1 lake; continuous ground-water levels for 222 wells, periodic ground-water levels for 772 wells and no miscellaneous water-level measurements; quality-of-water for 29 surface-water sites and 207 wells.

NTIS

Florida; Ground Water; Surface Water; Water Resources; Geological Surveys; Water Quality

19980009250 Geological Survey, Water Resources Div., Lansing, MI USA

Water Resources Data for Michigan, Water Year 1995 Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Blumer, S. P., Geological Survey, USA; Behrendt, T. E., Geological Survey, USA; Ellis, J. M., Geological Survey, USA; Minnerick, R. J., Geological Survey, USA; LeuVoy, R. L., Geological Survey, USA; May 1996; 337p; In English
Report No.(s): PB96-188651; USGS-WDR-MI-95-1; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Water resources data for the 1995 water year for Michigan consists of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and ground water levels. This report contains discharge records for 148 streamflow-gaging stations; stage only records for 2 stream-gaging stations and 19 lake-gaging stations; stage and contents for 4 lakes and reservoirs; water-quality records for 16 streamflow-gaging stations and 1 lake-gaging station; water-level records for 42 ground-water wells. Also included are 29 crest-stage partial-record stations and 2 low-flow partial-record stations. Additional water data were collected at various sites not involved in the systematic data-collection-program. Miscellaneous data were collected at 74 measuring sites.

NTIS

Data Acquisition; Ground Water; Michigan; Water Quality; Water Resources; Geological Surveys

19980009251 North Central Forest Experiment Station, Saint Paul, MN USA

Using Surveys as Input to Comprehensive Watershed Management: A Case Study from Minnesota

Kelly, T., Minnesota Dept. of Natural Resources, USA; Sushak, R., Minnesota Dept. of Natural Resources, USA; May 30, 1996; 36p; In English

Report No.(s): PB96-188198; FSGTR-NC-181; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Comprehensive watershed management, a new type of resource management now being implemented in southeastern Minnesota, recognizes that the watershed community and land managers can make choices that will result in a healthy watershed now and in the future. to succeed, such management needs four components: citizen participation, a comprehensive perspective, a long-term view, and partnership. In the following case study the authors focus on citizen participation and on the use of surveys to achieve it.

NTIS

Minnesota; Surveys; Watersheds; Environment Management; Resources Management; Land Use

19980009252 Geological Survey, Water Resources Div., Tallahassee, FL USA

Water Resources Data for Florida, Water Year 1995, Volume 4, Northwest Florida Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Franklin, M. A., Geological Survey, USA; Meadows, P. E., Geological Survey, USA; May 1996; 183p; In English
Report No.(s): PB96-188131; USGS/WDR/FL-95/4; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

The data for northwest Florida include continuous or daily discharge for 36 streams, periodic discharge for 2 streams, continuous or daily stage for 1 stream, periodic stage for 2 streams, peak stage and discharge for 1 stream; continuous or daily elevations

for 2 lakes, periodic elevations for 1 lake; continuous ground-water levels for 1 well, periodic ground-water levels for 4 wells; quality-of-water for 6 surface-water sites 0 wells.

NTIS

Ground Water; Surface Water; Water Resources; Hydrology; Geological Surveys

19980009266 Forest Service, Intermountain Research Station, Ogden, UT USA

Spatially Linking Basinwide Stream Inventories to Arcs Representing Streams in a Geographic Information System

Radko, M. A., Forest Service, USA; Jan. 1997; 26p; In English

Report No.(s): PB97-134340; FSGTR/INT-345; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper details procedures used to link the R1/R4 Fish Habitat Inventory data sets and other basinwide stream surveys to digitized arcs representing streams in a GIS to permit query and spatial display of fish habitat conditions. A secondary objective was to generate and acquire other thematic layers across a sample watershed to build a comprehensive, spatially oriented resource information database. These additional spatial data layers included transportation, hydrography, grazing allotments, and mining activities. Additional watershedwide spatial data layers were created from cartographic feature files, digital elevational models (DEM), and manual digitizing. Data sources and conversion methods are documented. Finally, examples are given of some of the kinds of queries and spatial displays that can be performed using GIS resource information database.

NTIS

Geographic Information Systems; Watersheds; Hydrography; Habitats; Data Bases; Display Devices; Streams

19980009280 Geological Survey, Onalaska, WI USA

Long Term Resource Monitoring Program Standard Operating Procedures: Quality Control to Cartographic Activities

Owens, T. W., Geological Survey, USA; Hop, K., Saint Mary's Coll., USA; Robinson, L., Geological Survey, USA; DeHaan, L., Saint Mary's Coll., USA; Francher, T., National Biological Service, USA; May 1997; 23p; In English

Report No.(s): PB97-179378; LTRMP-95-P008-7; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Environmental Management Technical Center has produced a series of standard operating procedure (SOP) manuals detailing the steps in producing spatial data sets to meet quality standards. This SOP manual is a continuation of that series detailing the quality control (QC) standards and procedures taken at each production step to ensure that the data are correct and can be passed to the next stage in the production process. Adherence to the SOPs detailed in the other manuals and to the QC procedures discussed in this manual ensure that errors are kept to a minimum and that the data are reliable for monitoring and research.

NTIS

Quality Control; Manuals; Standards; Aerial Photography; Environment Management; Image Analysis; Mapping

19980009287 Geological Survey, Water Resources Div., Sacramento, CA USA

Ground-Water Development and the Effects on Ground-Water Levels and Water Quality in the Town of Atherton, San Mateo County, California

Metzger, L. F., Geological Survey, USA; Fio, J. L., Geological Survey, USA; 1997; 39p; In English

Report No.(s): PB97-203061; USGS/WRI-97-4033; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The report presents the results of a study done within the San Francisquito cone, an alluvial fan that extends eastward from the Santa Cruz Mountains into San Francisco Bay in southern San Mateo County, California. During the study, the effects of pumping on ground-water levels and quality were assessed and a framework was established for future monitoring of geohydrologic conditions and land subsidence in the area.

NTIS

Ground Water; Water Quality

19980009346 Geological Survey, Water Resources Div., Tallahassee, FL USA

Water Resources Data for Florida, Water Year 1995, Volume 3A, Southwest Florida Surface Water Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Coffin, J. E., Geological Survey, USA; Fletcher, W. L., Geological Survey, USA; May 31, 1996; 276p; In English

Report No.(s): PB96-188685; USGS/WDR/FL-95/3A; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

The data for Southwest Florida include records of stage, discharge, and water quality of streams, contents, water quality of lakes and reservoirs, and water levels and water quality of ground-water wells. Volume 3A contains continuous or daily discharge for 72 streams, periodic discharge for 26 streams, miscellaneous discharge for 13 streams, periodic stage for 11 streams, continu-

ous or daily stage for 3 streams, peak stage and discharge for 11 streams, continuous or daily elevations for 3 lakes, periodic elevations for 25 lakes, and quality-of-water for 60 surface-water sites.

NTIS

Florida; Ground Water; Water Resources; Surface Water; Geological Surveys

19980009411 Instituto Nacional de Pesquisas Espaciais, Centro de Previsao de Tempo e Estudos Climaticos, Sao Jose dos Campos, Brazil

On the Suitability of Non-Parametric Tests for Detection of Trends in Brazilian Rivers

Marengo, Jose A., Instituto Nacional de Pesquisas Espaciais, Brazil; Tomasella, Javier, Instituto Nacional de Pesquisas Espaciais, Brazil; Uvo, Cintia R. B., Lund Univ., Sweden; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1492-1495; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

The non-parametric test of Mann-Kendall is used to determine whether there is, or not, an statistically significant trend in the series and as an indication of the general direction of the change. The Mann-Kendall statistic demands statistical independence of the series. Since the year-to-year correlation of streamflow in a given year with the same streamflow of the previous or subsequent year is usually quite low, the test has been widely applied in climatic and hydrologic data. However, it has been found that for regions with large basin-memory such as the Amazon basin or Pantanal, or under intense use of water for irrigation or electricity generation such as the Sao Francisco River basin, this test may be misleading due to a large serial autocorrelation of river data.

Author

Amazon Region (South America); Structural Basins; Irrigation; River Basins; Climatology; Trends; Water; Rivers

19980009495 Geological Survey, Water Resources Div., Columbus, OH USA

Water Resources Data for Ohio, Water Year 1995, Volume 1, Ohio River Basin Excluding Project Data Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Shindel, H. L., Geological Survey, USA; Mangus, J. P., Geological Survey, USA; Trimble, L. E., Geological Survey, USA; 1996; 302p; In English

Report No.(s): PB96-188628; USGS/WDR/OH-95/1; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

Water-resources data for the 1995 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground-water wells. This report, in two volumes, contains records for water discharge at 115 gaging stations, 24 partial-record sites; water levels at 331 observation wells; 20 crest stage gages; water quality at 12 gaging stations, 330 observation wells, and 24 partial record sites. Also included are data from miscellaneous and synoptic sites. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses.

NTIS

Data Acquisition; Ground Water; Ohio; Water Resources; Surface Water; Geological Surveys

19980009496 Geological Survey, Water Resources Div., Columbus, OH USA

Water Resources Data for Ohio, Water Year 1995, Volume 2, St. Lawrence River Basin and Statewide Project Data Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Shindel, H. L., Geological Survey, USA; Mangus, J. P., Geological Survey, USA; Trimble, L. E., Geological Survey, USA; 1996; 432p; In English

Report No.(s): PB96-188636; USGS/WDR/OH-95/2; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

Water-resources data for the 1995 water year for Ohio consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water levels and water quality of ground-water wells. This report, in two volumes, contains records for water discharge at 115 gaging stations, 24 partial-record sites; water levels at 331 observation wells; 20 crest stage gages; water quality at 12 gaging stations, 330 observation wells, and 24 partial record sites. Also included are data from miscellaneous and synoptic sites. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements and analyses.

NTIS

Data Acquisition; Ground Water; Ohio; Water Resources; Surface Water; Geological Surveys

19980009497 Geological Survey, Water Resources Div., Honolulu, HI USA

Water Resources Data for Hawaii and other Pacific Areas, Water Year 1989, Volume 2, Guam, Northern Mariana Islands, Federated States of Micronesia, Palau, and American Samoa Annual Report, 1 Oct. 1988 - 30 Sep. 1989

Fontaine, R. A., Geological Survey, USA; Kunishige, V. E., Geological Survey, USA; Lum, M. G., Geological Survey, USA; May 1996; 184p; In English

Report No.(s): PB96-188818; USGS/WDR/HI-89/2; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Water-resources data for the 1989 water year for other Pacific areas consist of records of discharge, and water quality of streams and stage of a lake and reservoir; water levels and water quality in wells; stage in a tide gage; and rainfall. This report volume 2 contains discharge records for 26 gaging stations; stage only for 2 gaging stations; water quality at 11 gaging stations, one streamflow partial record station, and 54 wells; water levels for 28 observations wells; and tide stages for one tide gage station. Also included are 2 crest-stage partial record stations, 4 miscellaneous partial-record stations, 15 low-flow partial-record stations, and 19 rainfall stations.

NTIS

Water Resources; Pacific Islands; Surface Water; Geological Surveys; Ground Water

19980009508 China Nuclear Information Centre, Beijing, China

Calculation of geometry factors using overlapping area method and experimental verification

Shi, Zhixia, Ministry of Nuclear Industry, China; Zhang, Aiming, Ministry of Nuclear Industry, China; Yuuji Minowa, Oarai Research Establishment, Japan; Sep. 1996; 9p; In Chinese

Report No.(s): CNIC-01099; CIRP-0015; DE97-618931; No Copyright; Avail: US Sales Only, Microfiche

The calculation of geometry factors under special conditions through a method based on the overlapping area of the source and the projection of the detector and experimental verification are introduced. The experimental verification was done in Oarai Institute of Japan Atomic Energy Institute under Japan STA Scientist Exchange Program. The sample chamber can be pumped and the distance between sample disk and detector is accurately adjustable. Semiconductor detector with the area of 450 sq mm and alpha standard sources Am-241, U-238, U-233, Pu-239 and Cm-244 were used for experiment. After the recalibration for the indication and actual separation between sample disk and detector, the activity of Am-241 source and the ADC zero point of multichannel, calculation values conform with experiment within 6%. When sample chamber is not vacuum, the experimental verification of geometry factors affected by alpha range is done with 2000 sq mm detector, and the theoretical values meet the experimental values very well after the revision of discriminating threshold and the thickness of detector windows. The relative coefficient is about 0.9999 and there are no significant differences after X(sup 2) and F check.

DOE

Computation; Numerical Analysis; Semiconductor Devices; Geometry; Alpha Particles

19980009513 Geological Survey, Water Resources Div., Pembroke, NH USA

Water Resources Data for New Hampshire and Vermont, Water Year 1996 Annual Report, 1 Oct. 1995 - 30 Sep. 1996

Coakley, M. F., Geological Survey, USA; Keirstead, C., Geological Survey, USA; Brown, R. O., Geological Survey, USA; Hilgendorf, G. S., Geological Survey, USA; Apr. 1997; 206p; In English

Report No.(s): PB97-167217; USGS/WDR-NH-VT-96-1; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This report contains discharge records for 74 gaging stations, stage records for 5 lakes, month end contents for 23 lakes and reservoirs, water quality for 10 gaging stations and water levels for 28 observations wells. Also included are data for 15 crest-stage partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program and are published as miscellaneous measurements. A few pertinent stations in bordering states are also included in this report.

NTIS

Water Resources; New Hampshire; Ground Water; Hydrology; Vermont; Surface Water; Data Acquisition

19980009622 Geological Survey, Water Resources Div., Salt Lake City, UT USA

Water Resources Data for Utah, Water Year 1995 Annual Report, Oct. 1994 - Sep. 1995

ReMillard, M. D., Geological Survey, USA; Birdwell, G. A., Geological Survey, USA; Lockner, T. K., Geological Survey, USA; Herbert, L. R., Geological Survey, USA; Allen, D. V., Geological Survey, USA; Jun. 1996; 353p; In English

Report No.(s): PB96-188610; USGS-WDR-UT-95-1; USGS/WRD/UT-95-1; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

Water resources data for the 1995 water year for Utah consist of records of stage, discharge, and water quality of streams; stage and contents of lakes and reservoirs; and water quality of ground water. The report contains discharge records for 174 gaging stations; stage and contents for 22 lakes and reservoirs; and water quality for 14 hydrologic stations and 186 wells; and water levels

for 50 observation wells. Additional water data were collected at various sites not involved in the systematic data collection program, and are published as miscellaneous measurements.

NTIS

Data Acquisition; Ground Water; Utah; Water Resources; Surface Water

19980009648 Environmental Protection Agency, Chesapeake Bay Program, Annapolis, MD USA

Restoring a Bay Resource: Riparian Forest Buffer Demonstration Sites

Jan. 1997; 72p; In English

Report No.(s): PB97-140750; EPA/903/R-97/001; CBP/TRS-159/97; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The riparian forest buffers in the document are located in agricultural, rural, and urban settings. An effort was made to locate restoration efforts in all three of these settings in order to show the buffers' applicability in different land uses. Several of the profiled restoration sites were included in the document because of the size of the riparian forest buffer planting. Two of the buffer sites were specifically planted as part of a nature trail that is designed to highlight the functions and values of riparian forest buffers to visitors. Finally, some of the profiled sites are part of a larger watershed forest buffer planting, meaning that the restoration effort consisted of planting contiguous woody vegetation along a stream, rather than at one isolated location.

NTIS

Forests; Restoration

19980009818 Geological Survey, Atlanta, GA USA

Stream-Temperature Characteristics in Georgia

Dyar, T. R., Geological Survey, USA; Aldaheff, S. J., Geological Survey, USA; 1997; 166p; In English

Report No.(s): PB97-181010; USGS/WRI-96-4203; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Stream-temperature measurements for 198 periodic and 22 daily record stations were analyzed using a harmonic curve-fitting procedure. Statistics of data from 78 selected stations were used to compute a statewide stream-temperature harmonic equation, derived using latitude, drainage area, and altitude for natural streams having drainage areas greater than about 40 square miles. Basin-by-basin summaries of observed long-term stream-temperature characteristics are included for selected stations and river reaches, particularly along Georgia's mainstem streams. Changes in the stream-temperature regimen caused by the effects of development, principally impoundments and thermal power plants, are shown by comparing harmonic curves and coefficients from the estimated natural values to the observed modified-condition values.

NTIS

Streams; Rivers; Flow Measurement; Temperature Measurement; Coefficients; Estimating; Drainage

19980009837 Geological Survey, Water Resources Div., Richmond, VA USA

Water Resources Data for Virginia, Water Year 1995, Volume 1, Surface-Water-Discharge and Surface-Water-Quality Records Annual Report, 1 Oct. 1994 - 30 Sep. 1995

White, R. K., Geological Survey, USA; Hayes, D. C., Geological Survey, USA; Eckenwiler, M. R., Geological Survey, USA; Belval, D. L., Geological Survey, USA; Herman, P. E., Geological Survey, USA; May 1996; 599p; In English

Report No.(s): PB96-188263; USGS/WDR/VA-95-1; No Copyright; Avail: CASI; A25, Hardcopy; A06, Microfiche

Water-resources data for the 1995 water year for Virginia includes records of stage, discharge, and water quality of streams and stage, contents, and water quality of lakes and reservoirs. This volume contains records for water discharge at 176 gaging stations; stage only at 1 gaging station; stage and contents at 10 lakes and reservoirs; and water quality at 31 gaging stations. Also included are data for 95 crest-stage partial-record stations. Locations of these sites are shown on figures 4 and 5. Miscellaneous hydrologic data were collected at 28 measuring sites and 38 water-quality sampling sites not involved in the systematic data-collection program.

NTIS

Data Acquisition; Virginia; Water; Water Quality; Water Resources; Surface Water; Hydrology; Geological Surveys

19980009876 Geological Survey, Water Resources Div., Urbana, IL USA

Water Resources Data for Illinois, Water Year 1995, Volume 2, Illinois River Basin Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Wicker, T. L., Geological Survey, USA; LaTour, J. K., Geological Survey, USA; Maurer, J. C., Geological Survey, USA; Jun. 1996; 328p; In English

Report No.(s): PB96-188560; USGS/WDR/IL-95/2; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Water-resources data for Illinois for the 1995 water year consist of records of stage, discharge, and water quality of streams; stage and content of lakes and reservoirs; and water level and water quality of ground-water wells. This volume contains (1) discharge for 90 streamflow-gaging stations and for 7 crest-stage partial-record streamflow stations; (2) stage for 9 stream-gaging stations; (3) water-quality records for 4 streamflow-gaging stations; (4) sediment-discharge records for 15 streamflow-gaging stations; (5) water-level records for 9 observation wells; and (6) water-quality records for 5 wells. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous water-quality analyses.

NTIS

Data Acquisition; Ground Water; Illinois; Water Quality; Surface Water; River Basins; Water Resources; Hydrology

19980009879 Geological Survey, Water Resources Div., Urbana, IL USA

Water Resources Data for Illinois, Water Year 1995, Volume 1, Illinois Except Illinois River Basin Annual Report, 1 Oct. 1994 - 30 Sep. 1995

LaTour, J. K., Geological Survey, USA; Maurer, J. C., Geological Survey, USA; Wicker, T. L., Geological Survey, USA; Jun. 1996; 268p; In English

Report No.(s): PB96-188552; USGS/WDR/IL-95/1; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Water-resources data for Illinois for the 1995 water year consist of records of stage, discharge, and water quality of streams; stage and content of lakes and reservoirs; and water level and water quality of ground-water wells. This volume contains (1) discharge for 76 streamflow-gaging stations and for 5 crest-stage partial-record streamflow stations; (2) stage for 4 stream-gaging stations; (3) stage for 2 reservoirs; (4) water-quality records for 2 streamflow-gaging stations; (5) sediment discharge records for 8 streamflow-gaging stations; (6) water-level records for 4 observation wells; and (7) water-quality records for 1 well. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous water-quality analyses.

NTIS

Data Acquisition; Ground Water; Illinois; Water; Water Quality; Water Resources; Geological Surveys; Surface Water; Hydrology

19980009902 Geological Survey, Reston, VA USA

Regional Diagenetic Patterns in the St. Peter Sandstone: Implications for Brine Migration in the Illinois Basin. Evolution of Sedimentary Basins-Illinois Basin

Pitman, J. K., Geological Survey, USA; Golhaber, M. B., Geological Survey, USA; Spoeetl, C., Geological Survey, USA; 1997; 23p; In English

Report No.(s): PB97-209381; USGS-BULL-2094-A; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Diagenetic minerals and alteration patterns in the Ordovician St. Peter Sandstone, Illinois Basin, record varied hydrologic and chemical conditions during the basin's long and complex geologic history. Major diagenetic events modifying the St. Peter Sandstone include (1) mechanical compaction, (2) early K-feldspar overgrowth and dolospar precipitation, (2) burial quartz, dolospar, anhydrite, and calcite cementation, and (4) carbonate-cement and K-feldspar grain dissolution. Stable-isotope geochemistry and fluid-inclusion paleothermometry suggest that burial cements precipitated from saline fluids over a wide temperature range. In the southern part of the basin, burial cements preserve a record of diagenetic effects that were in part controlled by fractures and hydrothermal-fluid circulation. Baroque dolospar cementation is the most significant of these effects.

NTIS

Feldspars; Sandstones; Sediments; Geochemistry; Fractures (Materials); Paleontology; Quartz; Minerals

19980009942 Congressional Budget Office, Washington, DC USA

Water Use Conflicts in the West: Implications of Reforming the Bureau of Reclamation's Water Supply Policies

Aug. 1997; 87p; In English

Report No.(s): PB97-210868; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Contents include the following: Water Use in the Western USA; Issues in Reforming Federal Water Policy; Water Development, Use, Conflicts, and Reform in California's Central Valley; Quantitative Analysis of the Central Valley Project Improvement Act; Lessons for the West; The Central Valley Project Improvement Act; and the Economic of Tools for Reforming Federal Water Policy.

NTIS

Quantitative Analysis; Water; Economics; Policies

19980009999 Airborne Instruments Lab., Deer Park, NY USA

Advanced FTIR Signal Processing for Airborne and Spaceborne Remote Sensing of Chemical Clouds *Final Report, Jul. 1995 - Mar. 1997*

Malik, Hans, Airborne Instruments Lab., USA; Jul. 22, 1997; 37p; In English

Contract(s)/Grant(s): F19628-95-C-0120; AF Proj. SERD

Report No.(s): AD-A330590; PL-TR-97-2053; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The feasibility of using a Fourier Transform Infrared (FTIR) spectrometer from an airborne platform for remote sensing of air pollution was investigated. Air Force Phillips Laboratory mounted a FTIR spectrometer into a small twin engine aircraft and obtained the data used in this investigation. The aircraft was flown over sections of New York and New England. The spectrometer was operated two different configurations, a passive configuration where the spectrometer viewed the warm ground and atmosphere below the aircraft, and an extractive mode where outside air was flushed through a 100 meter optical path gas cell. The spectral data were analyzed at AIL Systems Inc. for the presence of atmospheric pollutants.

DTIC

Fourier Transformation; Signal Processing; Air Pollution; Remote Sensors

19980010007 Geological Survey, Water Resources Div., Boise, ID USA

Water Resources Data for Idaho, Water Year 1996, Volume 1, Great Basin and Snake River Basin above King Hill *Annual Report, 1 Oct. 1995 - 30 Sep. 1996*

Brennan, T. S., Geological Survey, USA; Lehmann, A. K., Geological Survey, USA; O'Dell, I., Geological Survey, USA; Tungate, A. M., Geological Survey, USA; Apr. 25, 1997; 478p; In English

Report No.(s): PB97-171714; USGS/WDR/ID-96/1; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

The two volumes of this report contain discharge records for 190 stream-gaging stations and 32 irrigation diversions; stage only records for 6 stream-gaging stations; stage only for 8 lakes and reservoirs; contents only for 23 lakes and reservoirs; water-quality for 72 stream-gaging stations and partial record sites, 4 lakes sites; daily totals for 1 precipitation gage; and water levels for 564 observation wells.

NTIS

Idaho; Water Quality; Water Resources; Hydrology; Geological Surveys; Ground Water; Surface Water; Data Acquisition; River Basins

19980010047 Winand Staring Centre, Agricultural Research Dept., Wageningen, Netherlands

Fourier Analysis of Temporal NDVI in the Southern African and American Continents

Azzali, S., Winand Staring Centre, Netherlands; Menenti, M., Winand Staring Centre, Netherlands; 1997; 153p; In English; Original contains color illustrations

Report No.(s): PB97-161889; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

This report summarizes the results of two years investigation on the application of the Fourier analysis of temporal Normalized Difference Vegetation Index (NDVI) in Southern Africa and Southern America. The project provided the first detailed and quantitative climatology of the response of vegetation cover at the continental scale of Africa over a period of 10 years. The objectives of this project are: Extend the application of Fourier analysis of time series of NDVI, after the first very promising study of Zambia and Somalia, to longer time series and other climates and ecosystems; and Improve methods applied to map iso-growth zones in that first study.

NTIS

Fourier Analysis; Vegetation; Vegetative Index; Remote Sensing; Image Analysis

19980010339 Geological Survey, Water Resources Div., Altamonte Springs, FL USA

Water Resources Data for Florida. Water Year 1995, Volume 1A, Northeast Florida Surface Water *Annual Report, 1 Oct. 1994 - 30 Sep. 1995*

Jun. 01, 1996; 375p; In English

Report No.(s): PB96-188255; USGS/WDR/FL-95/1A; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The data for northeast Florida include continuous or daily discharge for 131 streams, periodic discharge for 10 streams, continuous, or stage for 24 streams, periodic stage for 0 streams; peak stage and discharge for 0 streams; continuous or daily elevations for 24 lakes, periodic elevations for 47 lakes; continuous ground water levels for 44 wells, periodic groundwater levels for 836 wells; quality-of-water data for 68 surface water sites and 32 wells.

NTIS

Florida; Ground Water; Surface Water; Water Resources; Data Acquisition; Water Quality; Hydrology

19980010579 Geological Survey, Ithaca, NY USA

Water Resources Data for New York, Water Year 1996, Volume 3, Western New York Annual Report, 1 Oct. 1995 - 30 Sep. 1996

Hornlein, J. F., Geological Survey, USA; Szabo, C. O., Geological Survey, USA; Zajd, H. J., Jr., Geological Survey, USA; Mulks, R. L., Geological Survey, USA; Jun. 1997; 304p; In English

Report No.(s): PB97-182117; USGS/WDR/NY-96/3; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

This volume contains records for water discharge at 67 gaging stations; stage only at 15 gaging stations; stage and contents at 6 gaging stations; water quality at 7 gaging stations, 9 wells, and 7 partial record stations; water levels at 17 observation wells; daily precipitation totals at 2 sites, and chemical quality of precipitation at 3 sites. Also included are data for 45 crest-stage partial record stations.

NTIS

Water Quality; Water Resources; Ground Water; Chemical Analysis; Stream Functions (Fluids)

19980010589 Geological Survey, Water Resources Div., Sacramento, CA USA

Water Resources Data for California, Water Year 1996, Volume 2, Pacific Slope Basins from Arroyo Grande to Oregon State Line Except Central Valley Annual Report, 1 Oct. 1995 - 30 Sep. 1996

Freeman, L. A., Geological Survey, USA; Webster, M. D., Geological Survey, USA; Friebe, M. F., Geological Survey, USA; Jun. 1997; 355p; In English

Report No.(s): PB97-180442; USGS/WDR/CA-96/2; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

Volume 2 contains discharge records for 107 gaging stations, gage height records for 7 stations, stage and contents for 6 lakes and reservoirs, precipitation data for 1 station, and water quality for 21 stations. Also included are data for 1 low-flow partial-record station and 7 miscellaneous measurement stations.

NTIS

California; Water Quality; Water Resources; Geological Surveys; Hydrology; Surface Water; Data Acquisition; Ground Water

19980010590 Geological Survey, Water Resources Div., Baton Rouge, LA USA

Water Resources Data for Louisiana, Water Year 1996 Annual Report, 1 Oct. 1995 - 30 Sep. 1996

Garrison, C. R., Geological Survey, USA; Lovelace, W. M., Geological Survey, USA; Montgomery, P. A., Geological Survey, USA; May 1997; 518p; In English

Report No.(s): PB97-180616; USGS/WDR/LA-96/1; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

The report contains records for water discharge at 64 gaging stations; stage only for 41 gaging stations and 5 lakes; water quality for 38 surface-water stations (including 22 gage stations) and 100 wells; and water levels for 235 observation wells. Also included are data for 117 crest-stage and flood-profile partial-record stations.

NTIS

Louisiana; Surface Water; Water Quality; Water Resources; Hydrology; Data Acquisition; Ground Water

19980010591 Geological Survey, Water Resources Div., Sacramento, CA USA

Water Resources Data for California, Water Year 1996, Volume 3, Southern Central Valley Basins and the Great Basin from Walker River to Truckee River Annual Report, 1 Oct. 1995 - 30 Sep. 1996

Rockwell, G. L., Geological Survey, USA; Anderson, S. W., Geological Survey, USA; Hayes, P. D., Geological Survey, USA; Jul. 1997; 499p; In English

Report No.(s): PB97-180707; USGS/WDR/CA-96/3; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

Volume 3 contains discharge records for 168 gaging stations, stage and contents for 43 lakes and reservoirs, precipitation data for 2 stations, and water quality for 30 stations. Also included is 1 crest-stage partial-record station.

NTIS

California; Water Quality; Water Resources; Ground Water; Surface Water; Hydrology; Geological Surveys

19980010856 Norwegian Defence Research Establishment, Kjeller, Norway

Land-Cover Mapping of Boreal Regions through LANDSAT and SPOT Multispectral Images. A Case Study: The Skedsmo Area in Southeast Norway

Tollefsen, T., Norwegian Defence Research Establishment, Norway; Jan. 2, 1996; 50p; In English; Portions of this document are not fully legible

Report No.(s): PB96-173380; FFI/RAPPORT-96/00023; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report discusses mapping of boreal vegetation by the use of LANDSAT and SPOT multispectral images. Such images are based on spectral signatures of vegetation, and consist of a series of spectral bands. The reflectance values within the bands may be used to infer the vegetation canopy. First, the authors discuss visual analysis through false-color composite images. They are based on selecting three spectral bands and assigning them to the three primary colors of the display device. The authors derive a color scheme for recognizing major types of boreal vegetation across various band combinations. Second, the authors perform a digital analysis through unsupervised classification using the Isodata clustering algorithm. This method will always partition the data into groups, but these may not necessarily correspond to distinctly different vegetation types.

NTIS

LANDSAT Satellites; Image Processing; Display Devices; Reflectance; Photomapping; Canopies (Vegetation); Cluster Analysis

19980010997 Geological Survey, Atlanta, GA USA

Water Resources Data Georgia Water Year 1996 Annual Report, 1 Oct. 1995 - 30 Sep. 1996

Stokes, W. R., Geological Survey, USA; McFarlane, R. D., Geological Survey, USA; May 02, 1997; 686p; In English
Report No.(s): PB97-176267; USGS/WDR/GA-96/1; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

The report contains discharge records of 131 gaging stations, stage for 25 gaging stations; stage and contents for 18 lakes and reservoirs; water quality for 180 continuing-record stations; and peak stage and discharge only for 104 crest-stage partial-record stations; water levels of 24 observation wells, and water quality for 1 precipitation-quality site.

NTIS

Water Quality; Water Resources; Reservoirs; Ground Water

19980011582 Geological Survey, Water Resources Div., Sacramento, CA USA

Evaluation of Ground-Water Flow and Solute Transport in the Lompoc Area, Santa Barbara County, California

Bright, D. J., Geological Survey, USA; Nash, D. B., Geological Survey, USA; Martin, P., Geological Survey, USA; 1997; 121p; In English

Report No.(s): PB97-179592; USGS/WRI-97-4056; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In 1986 the Santa Ynez River Water Conservation District entered into a cooperative program with the U.S. Geological Survey to study ground-water quality in the Lompoc area. The objectives of the second phase of the program, described in the report, were to (1) evaluate and quantify the hydrologic and water-quality information presented in the first phase of the study, and (2) demonstrate some general long-term effects on water levels and water quality likely to occur as a result of proposed ground-water management alternatives. The hydrologic analysis in the second phase included the development and calibration of a ground-water flow model and a solute-transport model. The finite-difference ground-water flow model was used to simulate hydraulic heads in the aquifer system beneath the Lompoc plain, upland, and terrace, and to provide vertical and lateral flow values for the solute-transport model. The finite-element solute-transport model was used to simulate dissolved-solids concentration in the main zone of the upper aquifer beneath the Lompoc plain.

NTIS

Aquifers; California; Ground Water; Hydrology Models; Water Flow; Water Management; Water Quality; Sediment Transport

19980011612 Forest Service, Southern Research Station, Asheville, NC USA

Forest Statistics for Arkansas' Delta Counties, 1995

Rosson, J. F., Forest Service, USA; Hartsell, A. J., Forest Service, USA; London, J. D., Forest Service, USA; Jan. 1997; 51p; In English

Report No.(s): PB97-154751; FSRB-SRS-11; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Tabulated results were derived from data obtained during a 1995 continuous forest inventory of Arkansas' Delta counties. These data are considered preliminary; a finalized State analytical report will be published after all survey units in the State have been inventoried. Core tables 1 through 25 are compatible among Forest Inventory and Analysis units in the Eastern USA. Supplemental tables 26 through 44 provide information beyond that provided by the core tables. Comparisons are made between results of the 1995 inventory and the previous inventory conducted in 1988.

NTIS

Forests; Arkansas; Geological Surveys; Timber Inventory; Statistical Analysis; Data Acquisition

19980011696 Naval Research Lab., Stennis Space Center, MS USA

Digital Map Requirements Study in Support of Advanced Cockpit Moving Map Displays Final Report

Lohrenz, Maura C., Naval Research Lab., USA; Trenchard, Michael E., Naval Research Lab., USA; Myrick, Stephanie A., Naval Research Lab., USA; VanZuyle, Paul, California Univ., USA; Perniciaro, Ralph E., Planning Systems, Inc., USA; Gendron, Mar-

lin L., Planning Systems, Inc., USA; Brown, Clare, Tulane Univ., USA; Oct. 10, 1997; 74p; In English
Report No.(s): AD-A332745; NRL/FR/7441--96-9652; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents the results of a digital map requirements study that the Naval Research Laboratory (NRL) performed for the Tactical Aircraft Moving Map Capability (TAMMAC) Integrated Program Team (IPT) at NAVAIR (PMA 209) in August 1995. The objective of the study was to establish the map data requirements for a new digital moving map system being built for the F/A-18, AV-8B, AH-1W, UH-1N, V-22, and potentially other aircraft. A primary NAVAIR goal in specifying the new system was to enhance situational awareness (SA) and aircrew mission effectiveness, without further burdening pilot task workload. To ensure that the end-users' explicit map needs were considered, NRL investigators elicited one-on-one aircrew evaluations of a wide variety of map data types (both topographic and tactical) and map display parameters, including feature size, orientation, color, symbology, etc., to help define an optimum map design for cockpit displays. NRL presented these map variations as a series of 16 demonstrations (on a Silicon Graphics workstation) to 30 pilots and aircrew at the Naval Air Warfare Center in Pax River, MD.

DTIC

Digital Data; Maps; Cockpits; Display Devices; Pilot Performance; Workstations

19980011872 Geological Survey, Water Resources Div., Tallahassee, FL USA

Simulation of Subsurface Storage and Recovery of Effluent Using Multiple Wells, St. Petersburg, Florida

Yobbi, D. K., Geological Survey, USA; 1997; 41p; In English

Report No.(s): PB97-180210; USGS/WRI-97-4024; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The model was used as a simulation tool to assess: (1) recovery efficiencies for injected water for multiple-well configurations, injection and recovery rates, volumes of injected water, injection/recovery ratios, length of storage times and background hydraulic gradients, and repeated cycles, and (2) the relation between recovery efficiency and the uncertainty in values for physical properties. The report also presents numerical analysis of hydraulic properties using the model.

NTIS

Effluents; Water Injection; Wells; Three Dimensional Models; Aquifers; Ground Water; Water Management; Recoverability; Underground Storage

19980011873 Geological Survey, Water Resources Div., Baltimore, MD USA

Water Resources Data for Maryland and Delaware, Water Year 1996, Volume 1, Surface-Water Data Annual Report, 1 Oct. 1995 - 30 Sep. 1996

James, R. W., Geological Survey, USA; Helinsky, B. M., Geological Survey, USA; Simmons, R. H., Geological Survey, USA; Tallman, A. J., Geological Survey, USA; Aug. 1997; 330p; In English

Report No.(s): PB97-207021; USGS/WDR/MD/DE-96/1-Vol-1; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

This volume contains records for water discharge at 90 gaging stations; stage and contents 1 reservoir; and water quality at 22 gaging stations. Also included are data for 4 crest-stages and 6 tidal crest-stage partial-record stations.

NTIS

Surface Water; Hydrology; Water Resources; Maryland; Delaware

19980011879 Forest Service, Southern Forest Experiment Station, Asheville, NC USA

Forest Statistics for Arkansas' Ouachita Counties, 1995

Rosson, J. F., Forest Service, USA; London, J. D., Forest Service, USA; Jan. 1997; 46p; In English

Report No.(s): PB97-154769; FSRB-SRS-10; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Tabulated results were derived from data obtained during a 1995 continuous forest inventory of Arkansas' Ouachita counties. These data are considered preliminary; a finalized State analytical report will be published after all surveys units in the State have been inventoried. Core tables 1 through 25 are compatible among Forest Inventory and Analysis units in the Eastern USA. Supplemental tables 26 through 44 provide information beyond that provided by the core tables. Comparisons are made between results of the 1995 inventory and the previous inventory conducted in 1988.

NTIS

Geological Surveys; Forests; Timber Inventory; Arkansas; Statistical Analysis; Data Acquisition

19980011882 Geological Survey, Water Resources Div., Sacramento, CA USA

Water Resources Data for California, Water Year 1995, Volume 3, Southern Central Valley Basins and the Great Basin from Walker River to Truckee River Annual Report, 1 Oct. 1994 - 30 Sep. 1995

Hayes, P. D., Geological Survey, USA; Rockwell, G. L., Geological Survey, USA; Anderson, S. W., Geological Survey, USA; Apr. 1996; 528p; In English

Report No.(s): PB96-193305; USGS/WDR/CA-95/3; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

Water-resources data for the 1995 water year for California consists of records of stage, discharge, and water quality of streams; stage and contents in lakes and reservoirs; and water levels and water quality in wells. Volume 3 contains discharge records for 167 streamflow-gaging stations, 1 crest-stage partial-record streamflow station; stage and contents records for 42 lakes and reservoirs; water-quality records for 76 streamflow-gaging stations and 6 partial-record stations; and precipitation records for 2 gaging stations.

NTIS

California; Lakes; Waste Water; Water Quality; Water Resources

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ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells; global sources of energy; geophysical conversion; and windpower. For related information see also 07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, and 28 Propellants and Fuels.

19980009133 NERAC, Inc., Tolland, CT USA

Tidal and Wave Power: Electric Power Generation (Latest Citations from the Energy Science and Technology Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-869094; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of tidal and wave energy for the generation of electric power. The engineering and economic aspects are emphasized. Theoretical analysis of energy generation potential for worldwide sites is presented. The combination of tidal power devices with pumped storage is also included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Tide Powered Generators; Electric Generators; Tidal Waves; Tidepower

19980009499 NERAC, Inc., Tolland, CT USA

Waste to Energy Facilities. (Latest citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867700; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning technical, economic, and environmental evaluations of facilities that convert waste to energy. Solid waste and municipal waste conversion facilities are highlighted. Feasibility studies, technical design, emissions studies, and markets for the resulting energy are discussed. Heat and electrical generation facilities are emphasized. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Solid Wastes; Waste Energy Utilization

19980009768 Sandia National Labs., Albuquerque, NM USA

Joint DOE/industry photovoltaic system reliability program

Maish, A. B., Sandia National Labs., USA; Atcitty, C., Sandia National Labs., USA; Hester, S., Utility Photo Voltaic Group, USA; 1997; 4p; In English; 26th; IEEE Photovoltaic Specialists Conference, 29 Sep. - 3 Oct. 1997, Anaheim, CA, USA

Contract(s)/Grant(s): DE-AC04-94AL-85000

Report No.(s): SAND-97-1159C; CONF-970953-2; DE97-007466; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

To achieve the lowest life-cycle cost (LCC), photovoltaic (PV) systems must have the optimum mix of low first cost, low operation and maintenance (O&M) cost, and high availability. Additionally, the long-term health of the photovoltaic (PV) industry requires that PV systems work as expected. Although PV modules now enjoy high reliability due to a significant multi-year effort

by both the U.S. Department of Energy (DOE) and industry, the same is not always true of PV systems. Even for systems that do operate reliably, customers, suppliers, and manufacturers can benefit from knowing what O&M expenses to expect. This knowledge will reduce technology risk to the customer and improve likelihood of commitment to PV projects. System integrators and utilities may benefit from O&M cost information to improve system designs, to properly price service agreements and warranties, and to optimize maintenance strategies. The DOE and component manufacturers may benefit from identifying cost drivers to optimally focus research and quality assurance resources to improve product reliability. This paper discusses the first of five tasks identified for this project, quantifying system reliability and life cycle cost by collecting, analyzing and reporting data on PV system reliability and cost. Industry participants collect the necessary O&M data on systems they are monitoring. Sandia provides support in the form of assistance identifying data that needs to be collected, helping develop forms or databases to collect the data, and analyzing the data.

DOE

Life Cycle Costs; Photovoltaic Conversion; Reliability

19980009781 NERAC, Inc., Tolland, CT USA

Silicon Solar Cell Efficiency (Latest Citations from the Ei Compendex*Plus Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868542; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the operational efficiency of silicon solar cells. Topics include cost effective methods to attain high volume production and practical applications of silicon solar cells. Development of high efficiency silicon space solar cells is also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Solar Cells; Energy Conversion Efficiency

19980009893 DRI/McGraw-Hill, Inc., Lexington, MA USA

Policy Implications of the GRI Baseline Projection of US Energy Supply and Demand to 2015, 1997

Mar. 1997; 30p; In English

Contract(s)/Grant(s): GRI-5096-800-3661; GRI-5095-800-3570

Report No.(s): PB97-161756; GRI-97/0007; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The summary of the 1997 Edition of the GRI Baseline Projection of U.S. Energy Supply and Demand discusses the implications of the projection that are important for GRI strategic planning and scenario development, and for the gas industry. The projection indicates that with adequate technology advances, natural gas will play a major role in an increasingly competitive energy mix well into the next century. It is expected that the expansion in gas markets experienced over the last decade will continue over the long term.

NTIS

Natural Gas; Market Research; Demand (Economics)

19980009993 EMC Engineers, Inc., Roswell, GA USA

High Temperature Hot Water Distribution System Study

Dec. 1996; 120p; In English

Contract(s)/Grant(s): DACA01-94-D-0033

Report No.(s): AD-A330813; EMC-1406-013; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The existing High Temperature Hot Water (HTHW) Distribution System has been plagued with design and construction deficiencies since startup of the HTHW system, in October 1988. In October 1989, after one year of service, these deficiencies were outlined in a technical evaluation. The deficiencies included flooded manholes, sump pumps not hooked up, leaking valves, contaminated HTHW water, and no cathodic protection system. This feasibility study of the High Temperature Hot Water (HTHW) Distribution System was performed Delivery Order 0013, Modification 1, issued to EMC Engineers, Inc. (EMC), by the Norfolk District Corps of Engineers, on 25 April 1996. The purpose of this study was to determine the existing conditions of the High Temperature Hot Water Distribution System, manholes, and areas of containment system degradation. The study focused on two areas of concern, as follows: * Determine existing conditions and areas of containment system degradation (leaks) in the underground carrier pipes and protective conduit. * Document the condition of underground steel and concrete manholes. to document the leaks, a site survey was performed, using state-of-the-art infrared leak detection equipment and tracer gas leak detection equip-

ment. to document the condition of the manholes, color photographs were taken of the insides of 125 manholes, and notes were made on the condition of these manholes.

DTIC

Electromagnetic Compatibility; Gas Detectors; Containment

19980010000 Maryland Univ., Inst. for Physical Science and Technology, College Park, MD USA

Exploring Rugged Energy Landscape in Large Systems Final Report, 15 Jan. 1994 - 4 Jan. 1997

Thirumalai, D., Maryland Univ., USA; Sep. 09, 1997; 8p; In English

Contract(s)/Grant(s): F49620-94-I-0106; AF Proj. 2303

Report No.(s): AD-A330580; AFOSR-97-0531TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During this grant period we tackled three problems all related to systems with rugged energy landscape: (1) Developing replica molecular dynamics method to detect bottle-necks in energy surface; (2) Characterizing the self-organization of biomolecules in terms of sequences; (3) Taming the energy landscape for design of biomaterials.

DTIC

Ruggedness; Models; Mathematical Programming; Topography

19980010440 Wilson Technologies, Inc., Santa Fe Springs, CA USA

CNG Transit Fueling Station Handbook Final Report, Oct. 1993 - Jun. 1997

Adams, R. R., Wilson Technologies, Inc., USA; Pennington, M. D., Wilson Technologies, Inc., USA; Feb. 1997; 525p; In English

Contract(s)/Grant(s): GRI-5093-941-2670

Report No.(s): PB97-163786; GRI-97/0092; No Copyright; Avail: CASI; A22, Hardcopy; A04, Microfiche

This manual has been compiled for use by a Transit Authority Engineer or an Engineering Company who is involved in the design of Compressed Natural Gas (CNG) fueling facilities. It is intended to provide a convenient and comprehensive reference document, to supplement but not replace codes and other reference documents. It is also intended to be used as a basis for the design of a broad range of CNG fueling facilities. The scope is limited to straight CNG and hence Liquefied Natural Gas (LNG) or LNG vaporization to CNG has not been addressed. Similarly, this document does not deal with the facility modifications which may be required to park, service, or fuel CNG buses indoors. Additional information on actual gas fueling is available from the Gas Research Institute.

NTIS

Compressed Gas; Natural Gas; Refueling

19980010464 Aerospace Corp., Electronics Technology Center, El Segundo, CA USA

The Utility of Volume-Based Static Cell Models

Thaller, Larry M., Aerospace Corp., USA; Sep. 01, 1997; 19p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A330568; TR-97(8555)-7; SMC-TR-97-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Static cell models of aerospace-type primary and secondary cell are described, along with examples illustrating their utility in resolving issues or questions relating to these cells. Each model is specific to one of four cell chemistries, but they all are limited to the volume and free volume characteristics of these cells. These models were developed in response to problems carried out within The Aerospace Corporation. The models were found to be very helpful in this respect, but can also be used in assessing proposed new cell designs that may have certain volume-related requirements or restrictions.

DTIC

Resolution; Static Models

19980010519 NERAC, Inc., Tolland, CT USA

Fuel Cell Operation. (Latest Citations from the Energy Science and Technology Database)

Mar. 1996; In English

Report No.(s): PB96-866397; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the operation of various types of fuel cells. Topics include power generation, control methods, and modeling. Internal and external reforming molten carbonate fuel cells are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Molten Carbonate Fuel Cells

19980010748 World Resources Inst., Washington, DC USA

Hydrogen: The Energy Carrier of the Future

Mackenzie, James J., World Resources Inst., USA; National Educators' Workshop: Update 1996; Jul. 1997, pp. 93-115; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This paper compares the present non-renewable energy resources (i.e. fossil fuels, crude oil, biomass, natural gases) with the future renewable energy technologies (hydrogen-carried energies). Properties discussed include: sustainability, consumption, environment effects, production, and storage. An outline of hydrogen research needs and goals is also included.

CASI

Energy Technology; Energy Sources; Hydrogen; Technological Forecasting

19980010771 Los Alamos National Lab., Technical Staff, NM USA

Electrolytic Production of Hydrogen Utilizing Photovoltaic Cells

Daugherty, Mark A., Los Alamos National Lab., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 359-370; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Hydrogen has the potential to serve as both an energy storage means and an energy carrier in renewable energy systems. When renewable energy sources such as solar or wind power are used to produce electrical power, the output can vary depending on weather conditions. By using renewable sources to produce hydrogen, a fuel which can be stored and transported, a reliable and continuously available energy supply with a predictable long-term average output is created. Electrolysis is one method of converting renewable energy into hydrogen fuel. In this experiment, we examine the use of an electrolyzer based on polymerelectrolyte membrane technology to separate water into hydrogen and oxygen. The oxygen is vented to the atmosphere and the hydrogen is stored in a small pressure vessel.

Author

Photovoltaic Cells; Windpower Utilization; Electrolysis; Energy Storage; Hydrogen; Hydrogen Fuels

19980010869 International Trade Commission Library, Washington, DC USA

In the Matter of Certain Variable Speed Wind Turbines and Components Thereof. Investigation No. 337-TA-376. REMAND (November 1997)

Nov. 1997; 40p; In English

Report No.(s): PB98-111289; USITC/PUB-3072; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This patent-based section 337 investigation was conducted by the Commission in 1995 and 1996 based on a complaint filed by Kenetech Windpower, Inc., of Livermore, California ('Kenetech') to determine whether there was a violation of section 337 in the importation, sale for importation, and/or the sale within the USA after importation, of certain variable speed wind turbines and components thereof by reason of infringement of claim 131 of the U.S. Letters Patent 5,083,039 ('the '039 patent') and claim 51 of U.S. Letters Patent 5,225,712 ('the '712'), both owned by Kenetech. Enercon GmbH of Aurich, Germany ('Enercon') and The New World Power Corporation of Lime Rock, Connecticut were named as respondents (collectively 'respondents').

NTIS

Investigation; Wind Turbines

19980010885 NERAC, Inc., Tolland, CT USA

Flywheel Energy Storage. (Latest Citations from the Energy Science and Technology Database)

Mar. 1996; In English

Report No.(s): PB96-866157; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of flywheels in energy storage systems and other applications. Discussion topics include flywheels as an energy storage device in wind power generation systems and as an alternative or back-up energy storage system for spacecraft power supplies and electric-powered vehicles. Other applications consider new materials for increased flywheel energy storage density, the role of magnetic bearings in energy storage systems and the use of flywheels in machinery.

NTIS

Electric Motor Vehicles; Energy Storage; Energy Technology; Flywheels; Magnetic Bearings; Spacecraft Power Supplies

19980011637 Helsinki Univ. of Technology, Espoo, Finland

Performance Characteristics of Porous Air Electrodes

El Haj Assad, M., Helsinki Univ. of Technology, Finland; Noponen, T., Helsinki Univ. of Technology, Finland; Sep. 1995; 45p; In English

Report No.(s): PB96-169693; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this study, cylindrical porous air electrode which is used for oxygen reduction and functions as cathode e.g. in metal/air batteries has been examined. Porous air electrode has great advantage due to its low weight, high capacity and no storage of oxygen is needed since oxygen which works as reagent is taken directly from air. Air electrode consists of a hydrophobic and a hydrophilic layer namely a gas supplying layer and a reaction layer.

NTIS

Electrodes; Fuel Cells; Porosity; Metal Air Batteries; Oxygen; Cylindrical Bodies; Cathodes

45

ENVIRONMENT POLLUTION

Includes atmospheric, noise, thermal, and water pollution.

19980009218 NERAC, Inc., Tolland, CT USA

Lead Pollution: Biological Effects. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865274; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the effects of environmental lead contamination on plants, animals, and humans. Included are references which concern the distribution and quantities of lead in various plants and animals.

NTIS

Bibliographies; Lead (Metal); Toxicology; Lead Poisoning; Biological Effects

19980009222 NERAC, Inc., Tolland, CT USA

Filtration and Flocculation in Industrial Processes. (Latest Citations from Fluidex)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865217; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theoretical aspects, system design, evaluations, and standards for filtration and flocculation techniques and equipment used in various industrial processes. Applications include air filtration, dust collection, water filtration, dewatering, and flocculant separation. A variety of filter types and flocculation mechanisms is discussed.

NTIS

Bibliographies; Filtration; Flocculating; Mathematical Models; Design Analysis; Evaluation; Standards

19980009257 Research Triangle Inst., Center for Environmental Analysis, Research Triangle Park, NC USA

Characterization of Manufacturing Processes and Emissions and Pollution Prevention Options for the Composite Wood Industry Final Report, Jan. 1994 - Aug. 1995

Martin, C., Research Triangle Inst., USA; Norheim, C., Research Triangle Inst., USA; Jun. 1996; 100p; In English

Contract(s)/Grant(s): EPA-68-D1-0118

Report No.(s): PB96-183892; RTI-94U-5807-00; EPA-600/R-96-066; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

The report summarizes information gathered on emissions from the composite wood industry (also called the Plywood and particleboard industry) and potential pollution prevention options. Some of these potential pollution prevention options presented in the report include: conveyor belt drying, low temperature drying, light moisture bonding adhesives, foam extrusion, and variable glue application rate. Other pollution prevention options presented in the report include alternative fiber sources (e.g., agricultural fiber and recycled wood waste) and naturally derived adhesives.

NTIS

Industries; Manufacturing; Plywood; Pollution Control; Composite Materials; Emission

19980009269 Southern Research Inst., Birmingham, AL USA

Active SOII Depressurization (ASD) Demonstration in a Large Building Final Report, Apr. 1993 - Nov. 1995

Williamson, A. D., Southern Research Inst., USA; Pyle, B. E., Southern Research Inst., USA; McDonough, S. E., Southern Research Inst., USA; Fowler, C. S., Southern Research Inst., USA; Dec. 1996; 123p; In English

Report No.(s): PB97-133805; SRI-ENV-94-849-7722.1.37; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The report gives results of an evaluation of the feasibility of implementing radon resistant construction techniques, especially active soil depressurization (ASD), in new large buildings in Florida. Indoor radon concentrations and radon entry were monitored in a finished building with the heating, ventilation, and air-conditioning (HVAC) system on and the ASD system off, and with the ASD systems activated in a temporary mode. Results from the study have demonstrated that, with sufficient attention to building design and construction, significant radon entry into a large building constructed on a site of high radon potential can be prevented.

NTIS

Radon; Space Heating (Buildings); Pressure Reduction; Air Conditioning Equipment; SOILs

19980009272 Environmental Protection Agency, Office of Water, Washington, DC USA

Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater

Dec. 1996; 246p; In English

Report No.(s): PB97-125298; EPA/821/B-96/005; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This document contains a compilation of the test procedures approved for the analysis of municipal and industrial wastewater under the Clean Water Act and listed at Appendix A to 40 CFR part 136. The compilation includes EPA 600- and 1600 series methods for the analysis of organic compounds.

NTIS

Water Pollution; Waste Water; Pollution Monitoring; Organic Compounds; Qualitative Analysis

19980009284 National Inst. of Standards and Technology, Gaithersburg, MD USA

CONTAM96 User Manual

Walton, G. N., National Inst. of Standards and Technology, USA; 1997; 77p; In English

Report No.(s): PB97-210769; NISTIR-6056; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This manual describes the use of a computer program, CONTAM96, for analyzing the air movement and indoor air quality in multizone buildings. The program is used to create and edit the building description including data for all features relating to airflow or to the generation and removal of contaminants. It uses a graphic interface to establish the spatial relationship of these features. These data along with weather data are used to calculate the airflows and dynamic levels in indoor contaminants. The results of the calculation may be reviewed graphically and printable files may be generated. This program is an extension of the earlier CONTAM93 program.

NTIS

User Manuals (Computer Programs); Graphical User Interface; Computer Programs; Meteorological Parameters; Air Quality; Air Flow

19980009288 Environmental Protection Agency, Subsurface Protection and Remediation Div., Ada, OK USA

NGWA Workshop on Permeable Reactive Barriers in Ground Water

Puls, R. W., Environmental Protection Agency, USA; Blowes, D. W., Waterloo Univ., Canada; Schultz, D. S., Environmental Protection Agency, USA; Vogan, J., Environmental Protection Agency, USA; Powell, R. M., ManTech Environmental Research Services Corp., USA; 1997; 10p; In English

Report No.(s): PB97-192827; EPA/600/A-97/029; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This workshop describes this innovative technology, provide examples of where it has been successfully applied, discuss site characterization needs for successful implementation, reactive materials selection, the conduct of pre-installation feasibility tests, methods of emplacement (already demonstrated and others currently being researched), and acceptable approaches for compliance and performance monitoring of emplaced systems.

NTIS

Ground Water; Permeability; Water Pollution; Pollution Control; Barrier Layers

19980009328 NERAC, Inc., Tolland, CT USA

Ground Water Pollution: General Studies (Latest Citations from the NTIS Bibliographic Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869631; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning sources, contaminant transport, and monitoring of pollutants in aquifers. Topics include pollution characterization from landfills and mine drainage, descriptions of study programs undertaken by specific states, and Superfund site studies of contaminated areas. The uses of mathematical models are also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Ground Water; Water Pollution; Bibliographies

19980009332 Brookhaven National Lab., Upton, NY USA

Report on intercomparisons of condensation nucleus counter measurements during the ACE-1 intensive study

Weber, R. J., Brookhaven National Lab., USA; Jun. 1997; 13p; In English

Contract(s)/Grant(s): DE-AC02-76CH-00016

Report No.(s): BNL-64570; DE97-008745; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This report summarizes findings from intercomparisons of aerosol particle concentrations measured by condensation nucleus counters (CNC's) on various platforms and ground-based stations during the Southern Hemisphere Marine Aerosol Characterization Experiment (ACE-1). Five CNC's on the NCAR C-130 are intercompared. The C-130 CNC's are then intercompared to ship ground-based measurements during periods of C-130 overflights.

DOE

Aerosols; Characterization

19980009347 Faucett (Jack) Associates, Inc., Bethesda, MD USA

Indirect Economic Impacts of Low-Emission Vehicle Standards for Heavy-Duty Vehicles Final Report, 1992 - Oct. 1995

Kornfield, T., Faucett (Jack) Associates, Inc., USA; Skolnik, J., Faucett (Jack) Associates, Inc., USA; Fischer, M., Faucett (Jack) Associates, Inc., USA; McGuire, C., Faucett (Jack) Associates, Inc., USA; Bowers, J., Faucett (Jack) Associates, Inc., USA; Oct. 1995; 199p; In English

Contract(s)/Grant(s): CARB-92-928

Report No.(s): PB96-187125; JACKFAU-464-95; No Copyright; Avail: CASI; A09, Hardcopy; A03, Microfiche

The object of the study was to identify and analyze the indirect economic impacts that could result if the California Air Resources Board (ARB) adopts reduced-emission vehicle standards for California-based heavy-duty vehicles (HDVs). The study only addressed issues that could arise if the ARB adopts California-only emission standards that are more stringent than national emission standards. The report also investigated potential economic incentive measures that could be used to prevent negative effects resulting from the implementation of more stringent California-only emission standards. The contractor investigated legal issues associated with the implementation of alternative economic incentive measures, conducted a focus group, case studies, and a survey, and prepared the final report.

NTIS

Economic Impact; Exhaust Emission; Exhaust Gases; Pollution Control; Air Pollution; Environmental Quality

19980009400 Instituto Nacional de Pesquisas Espaciais, Sao Jose dos Campos, Brazil

Pollutant Transport and Atmospheric Mixing in the Paraiba Valley-Brazil

Girard, Pierre, Instituto Nacional de Pesquisas Espaciais, Brazil; Moreira-Nordemann, Lycia M., Instituto Nacional de Pesquisas Espaciais, Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1045-1047; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

Rainfall was analyzed for four years in two locations of the Paraiba valley. The first site is Sao Jose dos Campos on the Valley floor, and the second is Sao Benedito on the valley flanks, some 70 km away. Industrial activity is going on in the cities of the valley floor while incipient agriculture and tourism occur on the valley flanks. Interestingly the rain chemistry of both sites differs little, indicating pollutant transport from industrial to rural zones and supporting the convective atmospheric circulation model proposed for the valley.

Author

Rain; Pollution Transport; Atmospheric Circulation; Valleys; Atmospheric Models; Brazil

19980009641 Naval Facilities Engineering Command, Atlantic Div., Norfolk, VA USA

Draft Environmental Impact Statement: Realignment of F/A-18 Aircraft and Operational Functions from Naval Air Station (NAS) Cecil Field, Florida, to Other East Coast Installations

Jan. 1997; 1036p; In English

Report No.(s): AD-A329792; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

This Draft Environmental Impact Statement (DEIS) addresses the environmental issues associated with the realignment of F/A-18 aircraft (i.e., fleet squadrons and the Fleet Replacement Squadron FRS) and operational functions from Naval Air Station (NAS) Cecil Field, Florida, which is scheduled to close, to other Navy and Marine Corps air stations on the East Coast. This proposed realignment is associated with the Navy's implementation of the 1995 mandated list of realignments prepared by the Defense Base Closure and Realignment Commission. The proposed action consists of the transfer of 11 F/A-18 fleet squadrons (132 aircraft) and the FRS (48 aircraft) (180 total aircraft) from NAS Cecil Field. The DEIS assesses five reasonable alternative realignment scenarios (ARSs) for the transfer of F/A-18 aircraft and personnel: ARS 1: Realignment of 11 F/A-18 fleet squadrons (132 aircraft) and the F/A- 18 FRS (48 aircraft) (180 total aircraft) to NAS Oceana, Virginia Beach, Virginia; ARS 2: Realignment of two F/A-18 fleet squadrons (24 aircraft) to Marine Corps Air Station (MCAS) Beaufort, South Carolina, and realignment of nine fleet squadrons and the FRS (156 total aircraft) to NAS Oceana; ARS 3: Realignment of three F/A-18 fleet squadrons (36 aircraft) to MCAS Cherry Point, North Carolina, and realignment of eight fleet squadrons and the FRS (144 total aircraft) to NAS Oceana; ARS 4: Realignment of five F/A-18 fleet squadrons (60 aircraft) to MCAS Beaufort; and realignment of six fleet squadrons and the FRS (120 total aircraft) to NAS Oceana; and ARS 5: Realignment of five F/A-18 fleet squadrons (60 aircraft) to MCAS Cherry Point and realignment of six fleet squadrons and the FRS (120 total aircraft) to NAS Oceana.

DTIC

Attack Aircraft; Jet Aircraft; Military Aircraft; Navy

19980009643 Federal Highway Administration, McLean, VA USA

Achievement Report, 1996, Turner-Fairbank Highway Research Center, 1 Oct. 1995 - 30 Sep. 1996

1996; 36p; In English; Incomplete microfiche

Report No.(s): PB97-130488; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Contents include the following: Statement of the Associate Administrator; Operations; Research Accomplishments; Technical Training; Reports and Periodicals; Abbreviations; and TFHRC Research Laboratories.

NTIS

Transportation; Research Projects

19980009774 NERAC, Inc., Tolland, CT USA

Hydrogen Chloride Air Pollution. (Latest citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867973; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning hydrogen chloride pollution and the control of acid emissions. Studies by the Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) on environmental impact of acid emissions are included. Instrumentation for detection and measurement of acid emissions is considered.

NTIS

Air Pollution; Chlorides; Environment Protection; Environmental Surveys; Pollution Control

19980009844 NERAC, Inc., Tolland, CT USA

Oil Pollution Detection and Sensing: Latest Citations from the NTIS Bibliographic Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862990; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning techniques used to detect and sense oil spills and slicks. Citations discuss remote sensing, chemical and biological monitoring, satellite imagery, surveillance, and models. Topics include pollution information systems, environmental monitoring, coastal ecology, and paths of pollutants. Pollution effects on fisheries, leak detectors, artificial oil pollution, remedial actions, and international cooperation are covered.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Oil Pollution; Pollution Monitoring; Detection

19980009887 Battelle Columbus Labs., OH USA

Lead Exposure Associated with Renovation and Remodeling Activities, Volume 1, Environmental Field Sampling Study

Menkedick, J. R., Battelle Columbus Labs., USA; Menton, R. J., Battelle Columbus Labs., USA; Constant, P., Battelle Columbus Labs., USA; Lord, R. A., Battelle Columbus Labs., USA; Strauss, W. J., Battelle Columbus Labs., USA; May 1997; 210p; In English

Report No.(s): PB97-185938; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The Residential Lead-Based Paint Hazard Reduction Act (Title X) required the U.S. Environmental Protection Agency (EPA) to conduct a study of lead exposure resulting from renovation and remodeling (R&R) activities (the R&R study). The report presents the results of one of the principal data collection efforts in the R&R study: the Environmental Field Sampling Study (EFSS). The monitored activities included both specific R&R activities such as carpet removal and window replacement, as well as miscellaneous generic activities such as drilling, sawing, or surface preparation (sanding, paint, scraping, etc.). Environmental samples collected in the EFSS included over 90 personal air samples taken within the breathing zone of R&R workers as they performed specific R&R activities, and over 500 samples of dust that settled on building surfaces within a specified period following completion of an activity. Worker exposure was assessed using the airborne lead levels from each worker's breathing zone, as measured by a task-length average (TLA) exposure. Potential exposure to building occupants was assessed using the dust samples collected by vacuum techniques from stainless steel dustfall collectors placed at specified distances from the activity.

NTIS

Hazards; Paints; Exposure; Air Sampling; Dust; Environment Protection

19980009988 SRI International Corp., Menlo Park, CA USA

Fate Assessment of New Air Force Chemicals Final Report, 15 May 1994 - 31 Jul. 1997

Mill, Theodore, SRI International Corp., USA; Spangord, Ronald, SRI International Corp., USA; Nov. 01, 1997; 46p; In English
Contract(s)/Grant(s): F49620-94-C-0031; AF Proj. 2303

Report No.(s): AD-A332058; AFOSR-97-06TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ammonium dinitramide (ADN) is hydrolytically stable in water at all environmentally relevant pHs from 2-10 at 25 deg C, with an estimated half life of about 370 years at pH 7. Biotransformation of ADN in water and soil, under aerobic and anaerobic conditions, was not observed. Aqueous and solid ADN photolyzed in sunlight very rapidly, with half lives of a few minutes in summer-fall season, making photolysis the dominant loss process for ADN in surface waters in all seasons. Quantum yields for ADN photolysis at 285 to 370 nm were 0.1 plus or minus 0.02 for aqueous ADN solutions and 0.3 to 0.04 between 300 and 325 nm for solid ADN. Major products included nitrite and nitrate ions and nitrous oxide (N₂O), and their proportions were unaffected by oxygen, cation nor wavelength. Solid ADN gave NO, N₂O, N₂ and nitrate ion. Cometabolism with glucose did lead to rapid biodegradation of ADN over 65 hours. Photolysis and biodegradation of the polyalkylperfluoroether Fomblin Z were evaluated under aerobic and anaerobic conditions. No direct photolysis is possible and no photooxidation with TiO₂ photocatalyst was detected. However, slow release of fluoride ion, found in anaerobic sediments, led to an estimate of 8500 days for the half life of the biodegradation.

DTIC

Ammonium Compounds; Biodegradation; Photolysis

19980009990 Aerospace Corp., El Segundo, CA USA

Ground Cloud Dispersion Measurements During The Titan IV Mission #K22 (12 May 1996) at Vandenberg Air Force Base, Volume 1, Test Overview and Data Summary

Jun. 1997; 104p; In English

Contract(s)/Grant(s): F04701-93-C-0094

Report No.(s): AD-A329639; TOR-TR-97(1410)-5; SMC-TR-97-18; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Launch vehicles that employ solid propellant rocket motors release exhaust ground clouds containing large quantities of hydrogen chloride (HCl) into the launch areas at Cape Canaveral Air Station (CCAS) and Vandenberg Air Force Base (VAFB). Large quantities of hazardous liquid fuels and oxidizers could also be released as a result of propellant transfer accidents or launch vehicle failures. The Air Force uses atmospheric dispersion models to predict the downwind diffusion and concentration of toxic launch clouds. There exists a strong need to collect launch cloud data that can be used to test and validate the performance of these dispersion models. The Air Force Space and Missile Systems Center's Launch Programs Office (SMCICL) is sponsoring the Atmospheric Dispersion Model Validation Program (MVP). This program is collecting launch cloud dispersion data that will be used to determine the accuracy of atmospheric dispersion models, such as REEDM, in predicting toxic hazard corridors at the

launch ranges. This report presents launch cloud dispersion and meteorological measurements performed during the #K22 Titan IV launch at Vandenberg Air Force Base on 12 May 1996.

DTIC

Launch Vehicles; Clouds; Dispersing; Meteorological Parameters; Launching; Exhaust Clouds; Chlorides

19980010008 Alaska Univ., Coastal Marine Inst., Fairbanks, AK USA

University of Alaska Coastal Marine Institute: Fiscal Year 1996 Annual Report No. 3

Alexander, V., Alaska Univ., USA; Feb. 1997; 189p; In English

Report No.(s): PB97-161996; OCS-Study-MMS-97-0001; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Contents include the following: Microbial Degradation of Aromatic Hydrocarbons in Marine Sediments; The Alaskan Frozen Tissue Collection and Associated Electronic Database: A Resource for Marine Biotechnology; Assessment of Topotrophic Level Predators as Bioindicators of Pollution; A Study of the Adsorption and Biodegradation of Aromatic Hydrocarbons by Marine Sediments; Kachemak Bay Experimental and Monitoring Studies; North Slope Amphidromy Assessment; Defining Habitats for Juvenile Flatfishes in South-central Alaska; Testing Conceptual Models of Marine Mammal Trophic Dynamics Using Carbon and Nitrogen Stable Isotope Ratios; Interaction between Marine Humic Matter and Polycyclic Aromatic Hydrocarbons in Lower Cook Inlet and Port Valdez, Alaska; Circulation on the North Central Chukchi Sea Shelf; New Project; and Funding Summary.

NTIS

Alaska; Marine Biology; Environmental Monitoring; Coastal Plains; Environment Effects

19980010049 Wyoming Univ., Dept. of Chemistry, Laramie, WY USA

Photochemical and Biological Degradation of Quadracyclane, Dinitramide and Perfluoropolyethers Final Report, Sep. 1995 - Sep. 1997

Sullivan, B. P., Wyoming Univ., USA; Buttry, Daniel A., Wyoming Univ., USA; Colberg, Patricia J., Wyoming Univ., USA; Oct. 06, 1997; 39p; In English

Contract(s)/Grant(s): F49620-94-I-0155; AF Proj. 2303

Report No.(s): AD-A330703; FQ8671-9400874; AFOSR-TR-97-0541; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes novel results concerning the chemistry and microbiology of quadracyclane (QC) and dinitramide (DN). No results are presented for perfluoropolyethers, since they were found to be intractable, and therefore resistant to degradation under our experimental conditions.

DTIC

Biodegradation; Photochemical Reactions

19980010104 Eastern Research Group, Inc., Lexington, MA USA

Report on the U.S. EPA Technical Workshop on WTI Incinerator Risk Assessment Issues

May 1996; 320p; In English; U.S. EPA Technical Workshop on WTI Incinerator Risk Assessment Issues, 11 Jan. 1996, Washington, DC, USA

Report No.(s): PB96-177753; EPA/630/R; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

This report presents information and materials from a peer review workshop organized by EPA's Risk Assessment Forum for Region 5 and the Office of Solid Waste and Emergency Response. The subject of the peer review was a draft document prepared by Region 5 assessing risk at an incinerator operated by Waste Technologies Industries (WTI) in East Liverpool, Ohio. This report summarizes the discussions that took place at the peer review workshop. The report opens with an overview of the workshop and a history of EPA's WTI incinerator risk assessment activities (section 1), then presents the chairperson's summary (section 2) and the five work group chairs' summaries (section 3). The body of the report ends with highlights of the peer reviewers' preliminary comments and of the comments offered by workshop observers (section 4).

NTIS

Assessments; Incinerators; Risk; Solid Wastes; Public Health; Hazardous Materials; Air Pollution; Waste Disposal

19980010118 Cornell Univ., Ithaca, NY USA

Unstable Fingered Flow in SOIL-Oil-Water-Air Systems: Theoretical Predictions and Experimental Verification Final Report, 1 Jun. 1994 - 31 May 1997

Steenhuis, Tammo, Cornell Univ., USA; Parlange, Jean-Yves, Cornell Univ., USA; Dicarlo, David, Cornell Univ., USA; Rimmer, Alon, Cornell Univ., USA; Darnault, Christophe, Cornell Univ., USA; Jul. 1997; 208p; In English

Contract(s)/Grant(s): F49620-94-I-0291

Report No.(s): AD-A329674; AFOSR-97-0386TR; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Contamination of soils, sediments, and groundwater with non-aqueous phase liquids (NAPLs) is the widespread environmental problem. In situ remediation technologies are the only viable treatments. Cleanup procedures are often instituted and operated with limited knowledge of contaminant vapor and liquid mass transfer and transport. We have used this Air Force grant to improve and extend into three-phase systems two separate visualization techniques which can rapidly record fluid concentrations in our soil slabs: light transmission and attenuation of synchrotron radiation. The techniques are complementary, and both provide high temporal and spatial resolution of fluid concentrations. Using these improved techniques we have obtained data concerning the source and scope of oil and water flow important for in situ remediation. We found that preferential flow in two- and three-phase systems (also called fingering) can control the movement of water through oil-contaminated soils and, thus, affect many remediation techniques. From theoretical arguments and high-speed experiments, we have been able to determine properties such as the size and fluid content in the fingers. Early experiments suggest that surfactants break up the fingers, yielding a better water-oil mixture with positive effects for biological breakdown of oils.

DTIC

Contaminants; Contamination; Ground Water; High Resolution; Light Transmission; Mass Transfer; Sediments; Spatial Resolution

19980010178 NERAC, Inc., Tolland, CT USA

Pollution Control Measures in the Iron and Steel Industry: Latest Citations from METADEX

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862875; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning processes and equipment used to control pollution in the iron and steel industries. References discuss treatment, reduction, recovery, recycling, and disposal of toxic and non-toxic pollutants. Emissions such as dust, fumes, and slag are examined.

NTIS

Bibliographies; Industries; Pollution Control

19980010179 NERAC, Inc., Tolland, CT USA

Environmental Issues in Nonferrous Metal Processing: Latest Citations from METADEX

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863030; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning environmental engineering in the nonferrous metals industry. Articles address issues such as energy conservation, waste minimization, air pollution control, water pollution control, and design-for-environment. Citations concern control of volatile organic emissions; the general shift to water-based systems for painting, priming, and cleaning; environmentally friendly stripping systems, waste water treatment, and recycle and recovery of metal scrap and wastes.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Nonferrous Metals; Environment Effects; Pollution Control

19980010189 Hughes Associates, Inc., Baltimore, MD USA

Halon as Hazardous Wastes: Policy Implications of Montreal Protocol Decision 7/12

Verdonik, D. P., Hughes Associates, Inc., USA; DiNenno, P. J., Hughes Associates, Inc., USA; Ball, D. N., Kidde International Research, UK; Shafer, R. A., Kidde Technologies, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 35-42; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

At their recent meeting, the Parties to the Montreal Protocol adopted a significant change to its provisions. The aim of the Protocol is the reduction of damage to the stratospheric ozone layer by manmade chemicals, in particular CFCs, HCFCs, and halons. to date, this aim has been addressed entirely by means of controls imposed on the production of these chemicals. In Vienna Decision 7/12, however, the Parties have moved markedly towards controls on use, by recommending "limiting the use of halons in new installations to critical applications" and "promoting the environmentally safe destruction of halons, when they are not needed in halon banks (existing or to be created)." Another aspect of this potentially landmark decision is the incorporation of environmental considerations other than ozone depletion: the Parties recommend "evaluating and taking into account only those substitutes and replacements of halon for which no other more environmentally suitable ones are available." Reaction to this deci-

sion by the largest and most important users of recycled halons, including the aerospace industry, may set the tone and future direction of the Montreal Protocol. Despite extensive and energetic research, feasible alternatives to halons have yet to be found for retrofit in most aerospace applications, and the likelihood is that current build and in-service aircraft will continue to rely on (recycled) agent for their lifetimes. It will be a serious challenge to frame and administer regulations that do not cause the halon bank, on which (at least) existing aircraft are likely to depend for a number of years, to become valueless. Worse, halon may effectively be categorized as a hazardous waste and thus become a liability, greatly increasing the likelihood of widespread venting with the associated environmental damage and depletion of the potential bank. The aerospace community needs to consider urgently how it can respond to Decision 7/12 - or the likely consequences in years to come of inaction.

Author

Hazardous Wastes; Environment Effects; Fluorocarbons; Bromine Compounds; Ozone Depletion; Alternatives; Chlorofluorocarbons; Environmental Control

19980010190 Pollution Prevention Planning, Inc., Stafford, VA USA

National Aerospace Standard 411: Does it Fit Into DoD Acquisition Reform?

DiGiandomenico, Carmen, Pollution Prevention Planning, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 43-48; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

This paper discusses the history of NAS 411, its early implementation and the question of whether it conforms to the tenets of recent Department of Defense (DoD) Acquisition Reform measures and policies. NAS 411 was first issued in July 1993. Acceptance and success of its implementation have varied greatly. Not by coincidence, NAS 411 implementation success is directly attributable to both the government and industry understanding of the standard, its intent and limitations. This paper provides insight into NAS 411, for achieving consistent implementation success. The paper also includes the latest information regarding DoD's implementation of Acquisition Reform and how NAS 411 does and doesn't fit the current DoD initiatives. The status of successful NAS 411 implementation within current DoD weapon system programs are included. Specific obstacles to NAS 411 implementation are discussed with recommendations for overcoming them.

Author

Environment Effects; Pollution Control; Hazardous Materials; Environment Management

19980010198 Science Applications International Corp., Huntsville, AL USA

Management Strategies for Multi-Use Government Facilities

Hale, Maurice, Science Applications International Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 109-112; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

Recent base closings, privatization of government facilities, and moves toward operation of portions of government programs by private contractors have created large multi-use areas requiring efficient environmental management. A strategy is described for management of just such a multi-use government facility in which an agency (NASA) and its Occupational Safety, Industrial Hygiene, and Environmental Services service contractor SAIC (Science Applications International Corporation) implemented management of the environmental affairs for both NASA Ames Research Center and the adjacent former Moffett Naval Air Station. by cooperatively managing both facilities using one management structure and one contractor with a "charge back" system of payment for services, both NASA Ames and the newly named Moffett Federal Airfield benefit from lower fees, faster responses, and better service. This paper describes the management strategy used by NASA, federal users of Moffett Federal Airfield, and SAIC to provide seamless environmental services and payments within a multi-use facility.

Author

Environment Management; Management Planning; Facilities; Government/Industry Relations

19980010199 Philips (Ronald J.) and Associates, Inc., Great Falls, VA USA

Environmental and Productivity Technology Innovation for the Food Manufacturing Industry

Philips, Ronald J., Philips (Ronald J.) and Associates, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 113-115; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

One of the first unit operations involved in processing of many horticultural commodities, and whole peeled tomatoes in particular, is peeling. Efficient removal of peel material is required for appearance and quality purposes and also to ensure uniform heating during processing operations. However, there is a tradeoff between removal of peel material and retaining as much flesh material, which translates to yield, as possible. Both chemical (lye) and mechanical systems of peeling have been utilized for horticultural products. Lye peeling involves the use of approximately 10-15% caustic soda (sodium hydroxide) or potassium hydroxide. The operation requires an ample water supply, lye, and a heat source. Products are passed through a heated lye solution,

washed with water and typically dipped in acid to neutralize the remaining traces of caustic soda. The objective of the mechanical peeling operation is to split or crack the peel to a sufficient degree that the entire peel will be subsequently removed when the product passes over mechanical peel eliminators, typically rubber disc rollers followed by a pinch roller bed. Products are typically "pressure peeled" which involves exposure to high pressure steam followed by a release to atmospheric pressure, or "vacuum peeled" which involves exposure to lower pressure steam followed by vacuum. In tomato products, the removal of peel material is required to meet the quality portion of the Standards of Identity. Canned tomatoes (21 CFR 155.190) and canned stewed tomatoes (21 CFR 155.190) are defined in the Standards of Identity issues under the Federal Food, Drug, and Cosmetic Act. These Standards state that peel per kilogram of the finished product must cover an area of not more than 15 sq cm (6.8 sq cm per pound) based on an average of all containers evaluated.

Derived from text

Food Processing; Peeling; Tomatoes; Mechanical Devices; Technology Utilization; Environment Effects

19980010210 Thiokol Corp., Brigham City, UT USA

Updated Assessment on the Environmental Impacts of Rocket Effluents

Bennett, R. R., Thiokol Corp., USA; Whimpey, J. R., Thiokol Corp., USA; Smith-Kent, R., Thiokol Corp., USA; McDonald, A. J., Thiokol Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 213-227; In English; Also announced as 19980010184; Sponsored in part by Donald Sauvageau.; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

Three independent studies regarding the environmental impacts of testing and launching rockets were published in the 1991-1992 time frame. Each of these studies concluded that these impacts are quite minor, but that there are several aspects which suffer from a lack of reliable data. Since these studies were published, there has been additional work in field measurements, exhaust cloud modeling, ozone depletion predicted by atmospheric models, and in alternate propellant development. There have also been changes in the recommendations of the AF Armstrong Laboratory (AL) regarding the concentrations of HCl to which the public should be exposed. The implementation of the most conservative of these recommendations had an impact on the launch probability of AF launch vehicles at Vandenberg Air Force Base (VAFB). This paper discusses the conclusions of the three earlier studies in light of the most recent data. Ozone depletion calculations using various models have been made. Both the transient local ozone depletion data, along with the longer term regional and global ozone depletion estimates are described. Recent calculations show that NO₂ produced from afterburning and atmospheric oxidation of liquid rocket exhaust clouds may be of comparable toxicity to HCl plus NO₂ from solid rockets. Neither type or rocket motor is predicted to pose a significant health risk. Current Air Force activities to improve launch probabilities include the modification of the plume dispersion program used to predict ground concentrations of exhaust species, and additional field measurements to verify the model predictions.

Author

Environment Effects; Exhaust Gases; Rocket Exhaust; Rocket Engines; Launching; Effluents; Combustion Products; Ozone Depletion

19980010213 Rockwell International Corp., Rocketdyne Div., Canoga Park, CA USA

SSME Component Processing Review

Price, Marlene, Rockwell International Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 245-251; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The SSME "Component Processing Review" (CPR) strategy was a team concept developed to maximize the effectiveness and efficiency of production operations while complying with challenging environmental regulations. All manufacturing operations, including cleaning processes, used to produce each major component of the SSME were identified. Unit Flow Analysis was applied in the examination of each operation for its contribution as a subset of the multi-step process used to produce a high-quality and cost-efficient product. This analysis assisted in the development of new cleaning processes which have replaced ozone-depleting and other hazardous materials. These new processes have had a significant impact on the role cleaning now plays in the production process. This paper discusses how to conduct this analysis.

Author

Space Shuttle Main Engine; Chemical Cleaning; Environment Effects; Cleaners; Engine Parts; Alternatives; Manufacturing

19980010214 Naval Air Warfare Center, Aircraft Div., Lakehurst, NJ USA

V-22 Aircraft Environmental Program

Kim, Cathy, Naval Air Warfare Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 253-262; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

Since February 1991, the Department of Defense (DoD) has required that weapon system acquisition programs incorporate environmental considerations into the development of the weapon system, including the design, test, operation, maintenance and disposal. Prior to this date, DoD's policies were oriented towards operation of facilities and installation, with the focus on the pollution control devices required for compliance, and the cleanup or restoration of problems created by past activities. Studies done by the DoD and individual services, have resulted in the conclusion that a major portion of the environmental problems experienced by the facilities and installations are a direct result of the weapon system being operated and maintained at these sites. Additional environmental policy and regulations, e.g., Executive Orders, have further specified environmental requirements for weapon system acquisition programs. The resulting problem was that there was no method established for implementing this environmental policy into an already complicated, expensive, and time consuming acquisition process. The V-22 Osprey Aircraft Program innovatively integrated the environmental requirements into the acquisition process. The Program established a multi-disciplinary team to coordinate and implement environmental requirements. This team consists of program management personnel, environmental and materials engineers, legal counsel, and U.S. Marine Corps aircraft maintenance personnel. The team developed an environmental strategy by analyzing the aircraft system and identifying specific technical and environmental issues. The environmental team educated as many people within the V-22 acquisition team as possible, and worked closely with the program's prime contractors - Bell Helicopter Textron, Boeing Helicopters and Allison Engine Company. Through the efforts of the government and the prime contractors, the V-22 program was able to establish and implement an effective environmental program. This program assures compliance with all environmental regulations and policies, but also provides a product that reduces the operating, support and disposal cost of the aircraft and decreases potential risk to personnel and the environment by reducing the use and generation of hazardous materials and wastes.

Author

V-22 Aircraft; Weapon Systems; Environment Effects; Hazardous Materials; Pollution Control; Environment Management; Aircraft Design

19980010218 Lockheed Martin Corp., Sciences Lab., Bay Saint Louis, MS USA

The Use of HFC (CFC Free) Processes at the NASA Stennis Space Center

Ross, Richard H., Lockheed Martin Corp., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 299-309; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The search for ozone depleting alternative chemicals was heightened when, in 1990, the more than 65 countries that had signed the Montreal Protocol agreed to phase out completely by the year 2000. In 1992, then-president Bush advanced this date for the USA to January 1, 1996. In 1991, it was realized that the planned phase out and eventual elimination of ozone depleting chemicals imposed by the Montreal Protocol and the resulting Clean Air Act (CAA) amendments would impact the cleaning and testing of aerospace hardware at the NASA Stennis Space Center. Because of this regulation, the Test & Engineering Sciences Laboratory has been working on solvent conversion studies to replace CFC-113. Aerospace hardware and test equipment used in rocket propulsion systems require extreme cleanliness levels to function and maintain their integrity. Because the cleanliness of aerospace hardware will be affected by the elimination of CFC-113; alternate cleaning technologies, including the use of fluorinated solvents have been studied as potential replacements. Several aqueous processes have been identified for cleaning moderately sized components. However, no known aqueous alternative exists for cleaning and validating T&ME and complex geometry based hardware. This paper discusses the choices and the methodologies that were used to screen potential alternatives to CFC-113.

Author

Rocket Engines; Engine Parts; Chemical Cleaning; Alternatives; Cleaners; Ozone Depletion; Chlorofluorocarbons; Hydrogen Compounds; Fluorination

19980010229 Lockheed Martin Tactical Aircraft Systems, Fort Worth, TX USA

Lockheed Martin Tactical Aircraft Systems Implements Computerized System to Monitor Water Quality

Obert, Stephen V., Lockheed Martin Tactical Aircraft Systems, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 419-428; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The ever increasing environmental regulations/requirements facing industries and municipalities over the last several years have resulted in these organizations dedicating considerable resources to keep pace. Lockheed Martin Tactical Aircraft Systems (LMTAS) is committed to meet and exceed the regulatory requirements. A fundamental element of a successful environmental program is dependable, accurate and timely monitoring of the facility's outfalls. Lockheed Martin Tactical Aircraft Systems operates Air Force Plant No. 4, a government owned, contractor operated facility. The facility is a conglomeration of buildings spread over 650 acres, bounded by Lake Worth to the north and Naval Air Station Fort Worth, Joint Reserve Base to the east. The primary

activity is the design, fabrication, assembly and testing of tactical fighter aircraft. In support of the water discharge monitoring requirements, and in support of a proactive monitoring program, The Environmental Resources Management group(ERM) at LMTAS saw a need to develop an automated water quality monitoring system. The original design concept was to: monitor water quality parameters; notify LMTAS personnel in the event of an alarm condition; and perform various sampling requirements. Radio frequency communication is used to link the field sites to the office-based control center. A pilot test was initiated in March of 1993, with system installation completed in May of 1993. The system was designed to integrate basically "off-the-shelf" components. This allows proven, reliable components to be integrated at low cost and with minimal design and engineering effort. Due to the numerous requirements, designing and developing a water quality monitoring system versatile enough to meet present and future needs is challenging. An Integrated Remote Monitoring and Notification System (IRMNS) was designed. It is built around a Geomation, Inc. control system which provides the platform for various instrument interfaces. The Measurement and Control Units (MCU's) are located at the field sites which accept and process numerous instrument outputs including 4-20 mA and RS 232. Once programmed, the MCU operates independently from the office based Monitoring Station (NMS) for extended periods of time. System programming is performed at the monitoring station and information is downloaded to the MCU's. The NMS is PC based, utilizing manufacturers designed software. The network controller also activates a auto dialer unit, which can auto dial multiple lines and deliver multiple messages when triggered. Alarm conditions at a monitoring site will activate the notification option. LMTAS has modified the network control station tying in a second PC which is used for data management functions. The system is capable of hosting multiple PC's through phone modems. Monitoring is accomplished with the use of multi sensor probes. Upon implementation of the final project phase, IRMNS will be monitoring between 65 and 75 inputs (channels) from the ten water discharge sites.

Author

Environment Management; Water Quality; Remote Control; Aircraft Industry; Environmental Monitoring; Computer Techniques

19980010238 Lawrence Livermore National Lab., Livermore, CA USA

A New Tool for Contamination Analysis

Meltzer, Michael, Lawrence Livermore National Lab., USA; Gregg, Hugh, Lawrence Livermore National Lab., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 509-512; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A01, Hardcopy; A06, Microfiche

The Contamination Analysis Unit (CAU) is a sensing system that facilitates a whole new approach to industrial cleaning. Through use of portable mass spectrometry and various desorption techniques, the CAU provides in-process, near-real-time measurement of surface cleanliness levels. It can be of help in significantly reducing hazardous waste generation and toxic air emissions from manufacturing operations.

Author

Contamination; Cleanliness; Mass Spectroscopy; Real Time Operation; Hazardous Wastes; Manufacturing

19980010241 Pennsylvania State Univ., Applied Research lab., State College, PA USA

Experimental Studies on the Removal of Airborne VOCs by a Pilot Scale Hybrid Air Treatment System

Schneider, Janice M., Pennsylvania State Univ., USA; Striebig, Bradle, Pennsylvania State Univ., USA; Watt, Lewis C., Pennsylvania State Univ., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 533-542; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

The Strategic Environmental Research and Development Program (SERDP) and the Marine Corps Logistics Bases (MCLB) have sponsored research on a 2500 cfm pilot scale hybrid air treatment system at The Applied Research Laboratory, The Pennsylvania State University. This hybrid system combines photolytic degradation, counter-current packed bed scrubbing, and carbon adsorption to treat a variety of airborne VOCs and HAPs at ambient temperature. In addition, the water and carbon are regenerated in-situ using advanced oxidation processes, eliminating secondary waste streams. The pilot scale system has been in operation for over one year. Solvents typically present in Marine Corps coatings have been treated in the system. The performance of each individual system component has been determined for alcohols, hydrocarbons, ketones, and chlorinated solvents. System performance relative to a solvent's chemical functionality and physical attributes has been explored. This work has shown that hybrid systems have a place in the treatment of exhaust air streams characterized by low concentrations of VOCs, high volumetric flow rates, changing VOC composition, and inconsistent flow rates. This paper will present the findings of these studies.

Author

Environment Effects; Organic Compounds; Chemical Cleaning; Solvents; Coatings; Air Flow; Paints

19980010242 Sikorsky Aircraft, Stratford, CT USA

Environmentally Friendly Cleaning Improvements for Overhaul Operations

Johnson, Peter H., Sikorsky Aircraft, USA; Melnick, Robert M., Sikorsky Aircraft, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 543-573; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

The Sikorsky Aircraft Overhaul and Repair Center (O&R) is committed to providing a safe and healthy work environment for all of its employees by upholding the highest safety and environmental standards. In recent years, a joint team from Manufacturing Engineering, Manufacturing, Design Engineering, and Environmental Health and Safety has implemented a number of initiatives that have resulted in dramatic environmental improvements at this facility. These efforts have led to significant reductions in hazardous waste and SARA reportable air emissions as well as providing a safer, more environmentally friendly working environment. This report summarizes the O&R process improvements associated with changes in part cleaning methodology. These projects have included: the elimination of perchlorethylene vapor degreasing through the introduction of a power washer and a hot oil / alkaline cleaning line; substitution of a high molecular weight alcohol for Freon in printed wiring board operations incorporation of an ultrasonic bearing cleaning line using an alkaline cleaner as a replacement for a dip tank system containing hazardous materials; and development of an innovative combination flush/cleaning booth for gearbox housings and assemblies to eliminate the use of 1-1-1 trichlorethane. Along with the environmental and health benefits gained through the introduction of these projects, each has been shown to provide additional benefits in the areas of cost savings, labor reduction, waste minimization, and increases in process efficiency.

Author

Chemical Cleaning; Cleaners; Environment Effects; Hazardous Wastes; Aircraft Maintenance; Ultrasonic Cleaning

19980010250 Modern Technologies Corp., Cleveland, OH USA

Implementation of Delta Air Lines' Environmental Management Information System (EMIS)

Balzer, Todd, Modern Technologies Corp., USA; Kinney, Robert W., Modern Technologies Corp., USA; Craig, Myles R., Delta Air Lines, Inc., USA; Johnson, Terry, Delta Air Lines, Inc., USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 631-641; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A03, Hardcopy; A06, Microfiche

In our changing business environment, Chemical Management becomes the infrastructure and the corner stone of environmental compliance assurance for the future of the aerospace industry. With well planned, well defined system requirements, extensive data quality assurance and strong coordination, great benefits can be achieved through implementation of a Hazardous Chemical Management Program in the aerospace industry. With strict regulatory assurance and cost effective Material Safety Data Sheets (MSDS) access, enhanced employee safety and operation cost benefits can be obtained. Delta Air Lines Inc.'s experience in moving to this goal is outlined in this paper. Please remember that the steps that Delta Air Lines took to obtain these goals were unique to Delta Air Lines; however, the basic methods that were used to meet these objectives can be used by any company in the aerospace industry.

Author

Commercial Aircraft; Aircraft Maintenance; Environment Management; Management Methods

19980010256 NASA Goddard Space Flight Center, Greenbelt, MD USA

The GSFC Combined Approach of ODC Stockpiling and Tribological Testing to Mitigate the Risks of ODC Elimination

Predmore, Roamer, NASA Goddard Space Flight Center, USA; Woods, Claudia, NASA Goddard Space Flight Center, USA; Hovanec, Andrew, NASA Goddard Space Flight Center, USA; Second Aerospace Environmental Technology Conference; Mar. 1997, pp. 693-701; In English; Also announced as 19980010184; No Copyright; Avail: CASI; A02, Hardcopy; A06, Microfiche

In response to the elimination of production of several Ozone Depleting Chemicals (ODCs) which have been widely used in successful space flight mechanism cleaning and lubricating procedures, GSFC developed and implemented an overall philosophy of mitigating the risks to flight hardware during the transition phase to ODC-Free cleaning procedures. One leg of that philosophy is the initiation of a several tier testing program which will deliver increasing amounts of information over the next few years, starting with original surface analysis comparisons between ODC and various ODC-Free cleaning technologies. The other leg is the stockpiling of an appropriate amount of ODC solvents such that all short term GSFC missions will be able to stay with or revert to heritage cleaning and lubricating procedures in the face of life issues. While tribological testing, mechanism life testing and space-flight experience will ultimately bring us into the 21st century with environmentally friendly means of cleaning long-life precision mechanism components, many satellites will be launched over the next few years with a number of important tribological questions unanswered. In order to prepare for this challenge, the Materials Engineering Branch in cooperation with the Electromechanical Branch launched an intensive review of all ongoing missions. The failure risk was determined for each long-

life mechanism based on a number of parameters, including a comparison of flight solvents used to clean the heritage/life test hardware. Also studied was the ability of the mechanism manufacturers to stockpile ODCs based on state laws and company policies. A stockpiling strategy was constructed based on this information and subsequently implemented. This paper provides an overview of the GSFC ODC elimination risk mitigation philosophy as well as a detailed examination of the development of the ODC stockpiling plan.

Author

Chemical Cleaning; Cleaners; Lubricants; Environment Effects; Solvents; Stockpiling; Tribology; Performance Tests; Alternatives

19980010419 District of Columbia Univ., Dept. of Biological and Environmental Sciences, Washington, DC USA

Establishing Regulatory Thresholds When Current Measurement Technology Is Unable to Monitor at Desired Health- or Technology-Based Thresholds

Wedande, L., District of Columbia Univ., USA; Oct. 1995; 130p; In English; 11th; Annual Waste Testing and Quality Assurance Symposium, 25 Jul. 1995, Washington, DC, USA

Report No.(s): PB96-189394; EPA/600/R-95/164; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A workshop, held as a part of the 11th Annual Waste Testing and Quality Assurance Symposium, which brought together Federal and State regulators, the regulated community and the commercial laboratory sector, served as a forum for discussion of how the U.S. Environmental Protection Agency (EPA) should set Resource Conservation and Recovery Act (RCRA) regulatory action levels when the risk- or technology-based levels are below what can be measured with generally available measurement technologies. The goal of the workshop was twofold. The first was to help the Agency solve this problem with the RCRA program. The second was to foster the Agency's goal of using, to the maximum extent possible, consistent approaches in establishing monitoring requirements and procedures in all Agency regulatory programs.

NTIS

Conferences; Environment Protection; Resources Management; Pollution Monitoring; Pollution Control; Quality Control

19980010431 NERAC, Inc., Tolland, CT USA

Oil Spills: Biological Effects. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865530; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the biological and ecological effects of oil spills. Citations discuss effects on microorganisms, plants, and animals. Damage assessment, ecological modeling, and environmental impact statements are included. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Biological Effects; Environment Effects; Oil Slicks; Ecology; Water Pollution

19980010449 Corps of Engineers, Washington, DC USA

SOil Vapor Extraction and Bioventing

Nov. 30, 1995; 255p; In English

Report No.(s): AD-A329943; EM-1110-1-4001; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

This manual provides practical guidance for the design and operation of SOil Vapor Extraction (SVE) and BioVenting (BV) systems. It is intended for use by environmental, civil, geotechnical, chemical, mechanical, and electrical engineers; geologists, hydrogeologists, and soil scientists; chemists; project managers; and others involved in any phase of SVE and BV projects. The manual describes current best practice for SVE and BV site characterization, system design, and system start-up and operations. Both SVE and BV technologies are still developing, and updates to this manual will be issued as appropriate.

DTIC

SOil Pollution; Hazardous Wastes; Design Analysis; Vapors

19980010458 Naval Facilities Engineering Service Center, Port Hueneme, CA USA

Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Administrative Record Management System (ARMS) User's Guide

Capito, Bonnie, Naval Facilities Engineering Service Center, USA; Potter, Christine, Naval Facilities Engineering Service Center, USA; Edwards, Wanda, Naval Facilities Engineering Service Center, USA; Sep. 1997; 60p; In English

Report No.(s): AD-A330658; NFESC-UG-2024-ENV; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Section 113 requires the establishment of an Administrative Record (AR) File for sites being cleaned up in compliance with this law. The AR contains all the information that supports the cleanup action decision. The CERCLA Administrative Record Management System User's Guide is to assist any government agency or private sector in developing and maintaining the AR in paper or electronic format. The guide provides the user with a step-by-step process for ensuring the AR File (ARF) is complete using guidance from the Environmental Protection Agency, the Department of Defense, and the Department of the Navy. The guide includes converting the ARF from paper to electronic format and generic samples of letters, surveys, and scopes of work that can be tailored to fit user requirements.

DTIC
Environment Protection; Management Systems; User Requirements

19980010552 Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, DC USA

Emergency Response to Hazardous Material Incidents (Training Manual)

Nov. 1995; 774p; In English

Report No.(s): PB96-963208; EPA/540/R-95/143; OSWER-9285.9-24A; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

This course provides emergency response personnel, primarily firefighters, police officers, and emergency medical services personnel, with the information and skills needed to recognize, evaluate, and control an incident involving the release of potential release of hazardous materials. It is intended for members of hazardous materials response teams. The focus of the course is on recognizing and evaluating a hazardous materials incident, organizing the response team, protecting response personnel, identifying and using response resources, implementing basic control measures, refining decision-making skills, and protecting the public. Topics that are discussed include chemical and physical properties of hazardous materials, toxicology, recognition and identification of hazardous materials, direct-reading instruments, standard operating procedures, personnel protection and safety, and sources of information.

NTIS

Toxicology; Hazardous Materials; Decontamination; Containment; Manuals; Emergencies; Medical Services

19980010578 Engine, Fuel, and Emissions Engineering, Inc., Sacramento, CA USA

Comparison of Off-Cycle and Cold-Start Emissions from Dedicated NGVs and Gasoline Vehicles Final Report, Jun. 1995 - Aug. 1996

Weaver, C. S., Engine, Fuel, and Emissions Engineering, Inc., USA; Chan, L. M., Engine, Fuel, and Emissions Engineering, Inc., USA; Feb. 11, 1997; 113p; In English

Contract(s)/Grant(s): GRI-5095-290-3421

Report No.(s): PB97-155014; GRI-96/0217; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This program compared pollutant emissions from original equipment manufacturer (OEM) produced natural gas vehicles, under realistic driving conditions such as cold start and hard accelerations, to emissions from similar vehicles using gasoline and reformulated gasoline (RFG). The vehicles tested were Ford Crown Victorias, Dodge Caravans, and Dodge Ram Vans. Test results showed that the OEM NGVs produce much lower emissions of non-methane organic gas (NMOG), and toxic air contaminants, and generally lower emissions of oxides of nitrogen (NOx) and carbon monoxide (CO) than similar vehicles using either gasoline or reformulated gasoline.

NTIS

Exhaust Emission; Natural Gas; Pollution Control; Air Pollution; Motor Vehicles; Alternatives

19980010618 Federal Aviation Administration, Cambridge, MA USA

U.S. Coast Guard 1995 Oil Pollution Research Grants Publications, Part1 Final Report

Aug. 1997; 259p; In English

Contract(s)/Grant(s): DTR57-95-G-00065

Report No.(s): AD-A330201; DOT-VNTSC-CG-97-1.1; CG-M-D-22-97-1; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The Oil Pollution Research Grants Program was created by the Oil Pollution Act (OPA) of 1990, P.L. 101-380 (OPA 90), 33 U.S.C. 28761(c)(8) and 2761(c)(9). The OPA established a regional research program and authorized those agencies represented on the Interagency Coordinating Committee on Oil Pollution Research, including the U.S. Coast Guard (USCG), to make grants to universities and other research institutions to perform research related to regional effects of oil pollution. The USCG established such a grant program and the John A. Volpe National Transportation Systems Center (Volpe Center), a component of the Research and Special Programs Administration of the Department of Transportation (DOT), was chosen to administer this program on

behalf of the USCG. In August 1995, the Volpe Center awarded seven one-year grants. Coast Guard funds were matched by funds from the university or non-profit research institution. This report contains the final reports for research performed under these grants.

DTIC

Oil Pollution; Grants; Research Projects

19980010817 Army Research Lab., Aberdeen Proving Ground, MD USA

(2+2) Resonance-Enhanced Multiphoton Ionization (REMPI) and Photoacoustic (PA) Spectroscopic Detection of Nitric Oxide (NO) and Nitrogen Dioxide (NO₂) Near 454nm Final Report, Jan. 1996 - Jan. 1997

Sausa, R. C., Army Research Lab., USA; Pastel, R. L., Army Research Lab., USA; Jul. 1997; 40p; In English

Contract(s)/Grant(s): DA Proj. 1L161102-AH43

Report No.(s): AD-A328140; ARL-TR-1418; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Trace concentrations of NO and NO₂ are detected with a dye laser operating near 454 nm. NO is detected by a (2 + 2) resonance-enhanced multiphoton ionization process by means of NO A (2)σ⁺ - X (2)Π(0,0) transitions with miniature electrodes, and NO₂ is detected by a one-photon absorption photo acoustic process by means of NO₂ A(tilde)' (2)B1(0, 8, 0) - X(tilde) (2)A1(0,0,0) transitions with a miniature microphone. Rotationally resolved excitation spectra show that the spectral resolution is sufficiently high to identify these species at 1 atm. The technique's analytical merits are evaluated as functions of concentration, pressure, and laser intensities. Low laser intensities favor NO₂ photoacoustic detection whereas high laser intensities favor NO ionization. Limits of detection (signal-to-noise ratio 3) of 160 parts in 10(exp 9) for NO and 400 parts in 10(exp 9) for NO₂ are determined at 1 atm for a 10-s integration time. Signal response and noise analyses show that three decades of NO/NO₂ mixtures can be measured with a computational relative error in concentration that is three times the relative error in measuring the NO and NO₂ signals.

DTIC

Nitrogen Oxides; Nitrogen Dioxide; Ionization; Spectroscopy; Photoacoustic Microscopy

19980010851 NERAC, Inc., Tolland, CT USA

Ozone Depletion Due to the Use of Chlorofluorocarbon: Government and Industry Response. (Latest Citations from the BioBusiness Database)

Mar. 1996; In English

Report No.(s): PB96-866082; Copyright Waived; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the response of business and government to atmospheric ozone depletion. Voluntary restrictions in the use of chlorofluorocarbons by industry and attempts to develop a substitute are examined. References cite studies of the ozone layer and the effects of aerosols worldwide, and examples of climatic models of ozone depletion. Government sponsored bans on chlorofluorocarbons are examined. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Ozone Depletion; Chlorofluorocarbons

19980010854 California Inst. of Tech., Dept. of Engineering and Applied Science, Pasadena, CA USA

Ozone Productivity of Atmospheric Organics, Coordinating Research Council Project A-10 Final Report

Sienfeld, J. H., Principal Investigator, California Inst. of Tech., USA; Bowman, F. M., California Inst. of Tech., USA; Feb. 06, 1996; 82p; In English

Report No.(s): PB96-174909; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This project addresses elucidating the fundamental chemical basis of incremental reactivities. The value of the incremental reactivity of a particular compound, given its atmospheric oxidation mechanism, depends on the VOC/NO(x) mixture in which the compound is imbedded. The dependence of incremental reactivity on the base VOC/NO(x) mixture has been an issue of concern since the introduction of the incremental reactivity as a regulatory concept. This project answers the basic question: how and why does the incremental reactivity of a compound change as the base VOC/NO(x) mixture is changed, both with respect to the individual VOC combustion and with respect to the overall VOC/NO(x) ratio. This paper is composed of several papers which describe the methodology used to examine incremental reactivities, indicate to what factors the incremental changes in ozone can be attributed, and explain the incremental reactivities of fuel oxygenates based on their reaction chemistry.

NTIS

Ozone; Mathematical Models; Chemical Reactions; Atmospheric Chemistry; Reaction Kinetics; Reactivity

19980010910 TRC Environmental Consultants, Inc., Chapel Hill, NC USA

Evaluation of Barriers to the Use of Radiation Cured Coatings in Wide-Web Flexographic Printing *Final Report, Jan. - Jun. 1995*

Vitas, J. B., TRC Environmental Consultants, Inc., USA; Harris, C. J., TRC Environmental Consultants, Inc., USA; Blake, W. O., TRC Environmental Consultants, Inc., USA; Oct. 1997; 140p; In English

Contract(s)/Grant(s): EPA 68-D2-0181

Report No.(s): PB98-106412; EPA-600/R-97-113; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The report gives results of a study to investigate and identify the technical, economic, and educational barriers to the use and implementation of radiation-curable coatings (primarily ultraviolet (UV) curable inks) in the wide-web flexographic printing industry. (NOTE: In support of the Source Reduction Review Project (SRRP), maximum achievable control technology (MACT) standards development, and the Pollution Prevention Act, EPA's Air Pollution Prevention and Control Division (APPCD) is investigating the current industrial use and barriers to the extended use of radiation-cured coatings in SRRP AND MACT categories.)

NTIS
Curing; Evaluation; Inks; Printing; Barrier Layers

19980010916 Environmental Protection Agency, Washington, DC USA

Resource Conservation and Recovery Information System (RCRIS) Data Element Dictionary (DED) (V.6.0.0. w/ Change Pages for 6.0.1, 6.1.0, 6.1.1, 6.1.2., 6.2.0, 6.3.0)

Jan. 1997; 805p; In English

Report No.(s): PB97-186233; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

RCRIS contains information on hazardous waste handlers regulated by EPA under the Resource Conservation and Recovery Act. The dictionary contains a glossary and provides definitions for each data element that appears in RCRIS fields.

NTIS
Hazardous Wastes; Resources Management; Environment Protection

19980010939 Research Triangle Inst., Research Triangle Park, NC USA

Improving Emissions Estimates with Computational Intelligence, Database Expansion, and Comprehensive Validation *Final Report, Aug. 1992 - Jan. 1994*

Cleland, J. G., Research Triangle Inst., USA; McCormick, V. E., Research Triangle Inst., USA; Waters, H. L., Research Triangle Inst., USA; Youngberg, J. R., Research Triangle Inst., USA; Zak, J. A., Research Triangle Inst., USA; Jan. 1997; 133p; In English

Contract(s)/Grant(s): EPA-CR-819542-01-0

Report No.(s): PB97-152565; RTI-81U-5388; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The report discusses an EPA investigation of techniques to improve methods for estimating volatile organic compound (VOC) emissions from area sources. Using the automobile refinishing industry for a detailed area source case study, an emission estimation method is being developed that uses advanced computational techniques and updated, comprehensive, emissions-related information. New computational techniques contributing to the estimation method are fuzzy logic, neural networks, and genetic algorithms. This method development requires a thorough characterization of the area sources, an analysis of current emission estimation methods, the development of execution of a nationwide industry activity survey, and a compilation and analysis of the survey results and other explanatory variables. Results will be captured in a personal-computer-based emissions estimation system called VOCEES (VOC Emissions Estimation System). VOCEES has been developed as a dual-use tool that prepares VOC emissions inventories and analyzes the impact of many factors on emissions. This methodology can be easily extended to other area sources.

NTIS
Genetic Algorithms; Neural Nets; Organic Compounds; Artificial Intelligence; Fuzzy Systems; Air Pollution; Estimating

19980010952 General Accounting Office, Washington, DC USA

Superfund: EPA Could Further Ensure the Safe Operation of On-Site Incinerators

Mar. 5, 1997; 32p; In English

Report No.(s): PB98-112014; GAO/RCED-97-43; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Environmental Protection Agency (EPA) has used incineration - that is, controlled, high-temperature burning - to clean up some of the most toxic forms of contamination at the nation's most severely contaminated hazardous waste sites, known as Superfund sites. EPA is responsible for ensuring that incinerators used at these sites burn hazardous waste in a manner that protects

human health and the environment. This report examines; (1) what safeguards EPA uses to promote the safe operation of incinerators at these sites and (2) whether EPA has fully implemented its planned system of safeguards.

NTIS

Environment Protection; Safety Management; Incinerators; Congressional Reports

19980010957 Johns Hopkins Univ., Dept. of Geography and Environmental Engineering, Baltimore, MD USA

Bioremediation of BTEX, Naphthalene, and Phenanthrene in Aquifer Material Using Mixed Oxygen/Nitrate Electron Acceptor Conditions

Wilson, L. P., Johns Hopkins Univ., USA; DAdamo, P. C., Johns Hopkins Univ., USA; Bouwer, E. J., Johns Hopkins Univ., USA; Oct. 1997; 152p; In English

Contract(s)/Grant(s): CR-821907

Report No.(s): PB98-106446; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The primary goal of this research is to further our understanding of the effect of mixed oxygen/nitrate electron acceptor conditions on the biodegradation of benzene, toluene, ethylbenzene, m-xylene, naphthalene, and phenanthrene. Specific objectives include: (1) identify subsurface microbial cultures with the ability to biodegrade aromatic hydrocarbons under aerobic and anaerobic denitrifying conditions; (2) quantify the stoichiometry and kinetics of biodegradation of aromatic hydrocarbons under aerobic, anaerobic denitrifying and microaerophilic conditions; and, (3) simulate various field bioremediation schemes using different nutrient/electron acceptor delivery schemes.

NTIS

Nitrates; Aquifers; Phenanthrene; Naphthalene; Acceptor Materials; Oxygen; Electron Emission; Water Pollution; Water Management

19980010995 Rijksinstituut voor de Volksgezondheid, Bilthoven, Netherlands

Stabilizing Greenhouse Gases: Global and Regional Consequences. Results from the IMAGE 2.0 Model

Alcamo, J., Rijksinstituut voor de Volksgezondheid, Netherlands; Krol, M., Rijksinstituut voor de Volksgezondheid, Netherlands; Leemans, R., Rijksinstituut voor de Volksgezondheid, Netherlands; 1997; 15p; In English

Report No.(s): PB97-204580; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of the brief report is to review some of the consequences of stabilizing greenhouse gas concentrations. It is thought that this information can be use in the process of selecting international policies for complying with the objectives of the Convention. The analysis concentrates on two stabilization scenarios in particular because they have been adopted for study by Working Group 1 of the IPCC.

NTIS

Greenhouse Effect; Concentration (Composition); Gas Composition

19980011525 NERAC, Inc., Tolland, CT USA

Bioremediation. (Latest citations from the NTIS Bibliographic Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851314; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the decomposition of toxic materials by biological means. Bacterial decomposition of jet fuel, wood preservatives, explosives, crude oil, halogenated organics, diesel fuel, aviation fuel, and creosote is discussed. Enhancement of decomposition rates by addition of nutrients is also included.

NTIS

Bibliographies; Hazardous Materials; Toxicity; Decomposition; Bacteria; Industrial Wastes; Waste Treatment

19980011531 NERAC, Inc., Tolland, CT USA

Radioactive Contamination and Radionuclide Migration in Groundwater. (Latest citations from the NTIS Bibliographic Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851199; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the contamination of groundwater with radionuclides and their subsequent migration. Monitoring surveys of existing sites with actual or potential radioactive groundwater contamination are included. Transport and migration models for radionuclides in groundwater are discussed. Natural radiation and accidental releases are con-

sidered in addition to anthropogenic sources of radioactive pollution such as waste storage and disposal. Contributions to radioactive pollution from uranium mining and processing are discussed in a separate bibliography.

NTIS

Bibliographies; Ground Water; Radioactive Wastes; Radioactive Contaminants; Monitors; Models

19980011534 NERAC, Inc., Tolland, CT USA

Dioxin Pollution: Sources, Control, Remediation, and Degradation. (Latest citations from the Energy Science and Technology Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851090; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the formation and subsequent fate of dioxin-containing wastes. Articles discuss methods to reduce dioxin formation, such as fuel modification in combustion systems, catalytic oxidation of flue gas, chemisorption from waste streams, ozone treatments, wet and dry scrubbing of air streams, and bioremediation. Citations also address sources of dioxin pollution, including incinerators, pulp and paper industry, power plants, and usage of herbicides. Natural degradation of these pollutants is also considered.

NTIS

Bibliographies; Defoliants; Pollution Control; Degradation; Waste Treatment; Technologies

19980011541 Colorado Univ., Natural Resources Law Center, Boulder, CO USA

Resource Management at the Watershed Level: An Assessment of the Changing Federal Role in the Emerging Era of Community-Based Watershed Management Final Report

Kenney, D. S., Colorado Univ., USA; Rieke, B., Colorado Univ., USA; Oct. 1997; 152p; In English

Report No.(s): PB98-113541; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The 1990s have seen a proliferation of 'watershed initiatives', in which stakeholders from a variety of governmental levels and jurisdictions have joined with nongovernmental stakeholders to seek innovative and pragmatic solutions to the problems associated with resource degradation and overuse. This phenomenon is first briefly placed within an institutional and historical context, and then 12 case studies of active watershed initiatives will be reviewed. This review examines the extent to which the watershed management movement is a promising and innovative trend worthy of greater support. In making this assessment, the changing role of the Federal Government in regional water management is of particular concern. After a review of findings and conclusions, some general recommendations are offered to assist policymakers in determining the appropriate Federal role in watershed initiatives and in identifying those areas where Federal laws and practices need to be modified to reach this desired condition.

NTIS

Policies; Resources Management; Watersheds; Water Management; Laws

19980011545 Applied Research Associates, Inc., Panama City, FL USA

Demonstration of a Filter Cart for NO(x) Removal from Ground Support Equipment Progress Report, Apr. 1995 - Apr. 1997

Canfield, C. Alan, Applied Research Associates, Inc., USA; Babyack, Rick, Sorbent Technologies Corp., USA; Wander, J. D., Armstrong Lab., USA; May 16, 1997; 9p; In English

Contract(s)/Grant(s): F08635-93-C-0020; AF Proj. 2103

Report No.(s): AD-A332761; AL/EQ-TP-1997-0001; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

McClellan AFB, California, identified mobile diesel engines as contributing nearly as much oxides of nitrogen (NO(x)) emissions as aircraft and permitted stationary sources combined. Hourly-rated diesel engines contributed 75 percent of this NO(x), with the remainder emitting from gasoline and diesel engines rated in miles. The Armstrong Laboratory Environics Directorate at Tyndall AFB, Florida, with the support of Applied Research Associates and Sorbent Technologies, has developed and demonstrated a simple and effective technology for reducing non-road diesel NO(x) and other air pollutant emissions. The filter cart was designed to control emissions of NO(x), particulate, and unburned hydrocarbons (UHCs) from mobile diesel generators. It uses a simple vermiculite-based filter to capture particulate, a large air-to-air heat exchanger to cool the gas, a demister to remove condensable liquids, and rows of activated carbon (AC) filters to adsorb NO(x) and UHCs. A separate stand-alone system is used to

desorb and destroy the contaminants adsorbed on the AC filters. Over 90-percent removals of NO(x) by the filter cart have been repeatedly demonstrated in the field.

DTIC

Air Pollution; Nitrogen Oxides; Ground Support Equipment; Diesel Engines; Exhaust Emission; Activated Carbon; Hydrocarbons; Filters

19980011577 Environmental Protection Agency, Research Triangle Park, NC USA

Regional Approaches to Improving Air Quality

May 1997; 16p; In English

Report No.(s): PB97-184329; EPA/451/K-97/001; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The brochure describes selected air pollutants of regional concern in the U.S. summarizes ongoing efforts to control them.

NTIS

Pollution Control; Air Pollution; Environmental Control; Environmental Engineering; Air Quality

19980011578 North Carolina Univ., Dept. of Environmental Sciences and Engineering, Chapel Hill, NC USA

Relative Ozone Forming Potential of Methanol-Fueled Vehicle Emissions and Gasoline-Fueled Vehicle Emissions in Outdoor Smog Chambers Final Report

Jeffries, H. E., North Carolina Univ., USA; Sexton, K. G., North Carolina Univ., USA; Jan. 1995; 169p; In English

Report No.(s): PB97-181226; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

This experimental program compares the relative NO oxidation and O₃ forming capabilities of surrogate VOC mixtures that are representative of urban air, emissions from vehicles using methanol fuels, and emission from vehicles using industry-average gasoline and Fuel F, one of the reformulated fuels used in the Auto/Oil test program. The urban VOC mixture was based upon ambient air analyses conducted by EPA for 6-9 AM in 41 cities over the period 1984-1988. The automotive VOC mixtures were based upon exhaust, evaporative, and running loss measurements made in the Auto/Oil Air Quality Improvement Research Program and upon the application of EPA's MOBILE4 emissions model applied in an Urban Airshed scenario in Dallas/Fort Worth in the year 2005. In addition to testing the relative reactivity of each VOC mixture against the other mixtures, the majority of the experiments used mixtures in which 50% of the carbon was from urban mix and 50% of the carbon was from industry-average gasoline vehicle emissions or 50% of the carbon was from the methanol-fueled vehicle emissions. Some experiments were also conducted with higher fractions of formaldehyde (HCHO) in either the urban mix or in the methanol mix. Another set of experiments compared just the alkane and alkene fractions while in another set, just the aromatic species reactivities were compared.

NTIS

Exhaust Emission; Ozone; Methyl Alcohol; Gasoline; Combustion Products

19980011588 Evergreen State Coll., Graduate Program in Environmental Studies, Olympia, WA USA

Forging the Links: The Report of a Policy Study on Created Wetlands for the Washington State Department of Transportation Final Report, 1 Jul. 1995 - 31 Jan. 1997

Perkins, J., Evergreen State Coll., USA; Murphy, R., Evergreen State Coll., USA; Savage, M., Washington State Dept. of Transportation, USA; Jones, L. E., Evergreen State Coll., USA; Pratt, R., Evergreen State Coll., USA; Jan. 1997; 203p; In English
Report No.(s): PB97-175780; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

This research project examined the activities at the Washington State Department of Transportation (WSDOT or 'the Department') to mitigate losses of wetlands on 33 sites governed by permits from the U.S. Army Corp of Engineers other agencies, through 1995. Several concerns defined the reasons WSDOT commissioned this study, including the rapid growth in the number of sites, uneven and unpredictable biological performance of the sites, and highly diverse expectations from regulators. Specific research findings are organized within five key categories that provide challenges to the ability of the Department to engage in successful mitigation: political, policy, fiscal, organizational, and biological.

NTIS

Wetlands; Costs; Environmental Monitoring

19980011602 DynCorp, Environmental Programs Div., Alexandria, VA USA

Guidance on the Documentation and Evaluation of Trace Metals Data Collected for Clean Water Act Compliance Monitoring, January 1996

Jan. 1996; 33p; In English

Report No.(s): PB96-193297; EPA/821/B-96/002; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The document contains guidance that is intended to aid in the review of trace metals data submitted for compliance monitoring purposes under the National Pollutant Discharge Elimination System (NPDES) when these data are collected in accordance with Method 1669 and analyzed by the 1600 Series Analysis Methods. Chapter 2 of the document outlines the data elements that must be reported by laboratories and permittees so that EPA reviewers can validate the data. Chapter 3 provides guidance concerning the review of data collected and reported in accordance with Chapter 2. Chapter 4 provides a Data Inspection Checklist that can be used to standardize procedures for documenting the findings of each data inspection.

NTIS

Contaminants; Water

19980011608 Army Construction Engineering Research Lab., Champaign, IL USA

The Environmental Assessment and Management (TEAM) Guide California Supplement *Final Report*

ORourke, Carolyn, Army Construction Engineering Research Lab., USA; Sep. 1997; 840p; In English

Contract(s)/Grant(s): MIPR-2257

Report No.(s): AD-A330140; CERL-SR--96/88-Rev; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Environmental assessments help determine compliance with current environmental regulations. The U.S. Air Force, U.S. Army, Defense Logistics Agency, and Corps of Engineers (Civil Works) have adopted environmental compliance programs that identify compliance problems before they are cited as violations by the U.S. Environmental Protection Agency (USEPA). Since 1984, the U.S. Army Construction Engineering Research Laboratories (USACERL), in cooperation with numerous Department of Defense (DOD) components, has developed environmental compliance assessment checklist manuals. The Environmental Assessment and Management (TEAM) Guide was developed for use by all DOD components. Currently there are five participating DOD components: the Air Force, Air National Guard, Army, Civil Works, and Defense Logistics Agency (DLA). These agencies have agreed to share the development and maintenance of this Guide. The Guide combines Code of Federal Regulations (CFRs) and management practices (MPs) into a series of checklists that show legal requirements and the specific operations or items to review. TEAM Guide is supplemented by DOD component-specific manuals detailing DOD component regulations and policies. The California Supplement was developed to be used in conjunction with the TEAM Guide, using existing California state environmental legislation and regulations as well as suggested management practices.

DTIC

Assessments; Armed Forces (USA); Civil Defense; Environment Management; Environment Protection

19980011693 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

Decontaminating Materials Used in Groundwater Sampling Devices

Parker, Louise V., Army Cold Regions Research and Engineering Lab., USA; Ranney, Thomas A., Army Cold Regions Research and Engineering Lab., USA; Oct. 1997; 36p; In English

Report No.(s): AD-A332735; CRREL-SR-97-24; SFIM-AEC-ET-CR-96200; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In these studies, the efficiency of various decontamination protocols was tested by using small pieces of materials commonly used in groundwater sampling devices. Three types of materials that ranged in their ability to sorb organic solutes were tested: stainless steel, polyvinyl chloride (PVC), and polytetrafluoroethylene (PTFE). These test pieces were exposed to two aqueous test solutions: one solution contained three volatile organic compounds and one nitroaromatic compound, and the other solution contained four pesticides of varying hydrophobicity. Also, three types of polymeric tubing were exposed to pesticide solutions. Generally, contact times for sorption and desorption were 10 minutes and 24 hours. The test results indicate that, generally, organic contaminants are removed from these materials simply by washing with a hot detergent solution and rinsing with hot water. The exceptions were low-density polyethylene tubing that was exposed to a pesticide test solution for 24 hours and allowed to desorb for 24 hours, and PTFE that was exposed to volatile organics for 24 hours. For these, a hot detergent water wash and rinse followed by oven drying at -105 C was the most effective treatment. With this treatment, VOCs were not detected desorbing from the PTFE, and pesticide contamination desorbing from LDPE was substantially reduced. Solvent rinsing did not improve removal of VOCs and only marginally improved removal of pesticides from LDPE.

DTIC

Decontamination; Stainless Steels; Ground Water; Samplers; Polyvinyl Chloride; Polytetrafluoroethylene; Organic Compounds; Desorption

19980011694 Waterloo Univ., Dept. of Earth Sciences, Ontario Canada

Field and Laboratory Studies of Pulsed Pumping for Cleanup of Contaminated Aquifers

MacKay, Douglas M., Waterloo Univ., Canada; Wilson, R. D., Waterloo Univ., Canada; Brown, M. J., Waterloo Univ., Canada; Ball, William P., Johns Hopkins Univ., USA; Durfee, Donald P., Johns Hopkins Univ., USA; Xia, Guoshou, Johns Hopkins Univ., USA; Liu, Chongxuan, Johns Hopkins Univ., USA; Jul. 28, 1997; 219p; In English

Contract(s)/Grant(s): F08635-93-C-0032

Report No.(s): AD-A332736; AL/EQ-TR-1997-0017; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

A field-scale investigation of pump-and-treat remediation was conducted at Dover AFB, DE, in sheet-pile test cells isolating two adjacent segments of a long-extant groundwater plume. For a given volume of extracted water, the fractional removal of contaminant mass was higher for the pulse pumped cell (PPC) than the continuously pumped cell (CPC) for all contaminants whose maximum aquifer concentrations were at or very near the aquifer/aquitard interface. Overall, the results of this work indicate that contaminant transport and subsurface remediation are influenced not only by (1) spatial variability of the transport medium (aquifer), but also by (2) spatial variability in the pre-remediation contaminant distribution, and (3) spatial variability of the sorption properties of the impacted low permeability media (aquitards, clay lenses, etc.). The results of this work have been and will continue to be extrapolated from Dover-specific conditions to a variety of hydrogeologic situations via modeling to emphasize the effects of aquitard and

DTIC

Ground Water; Contaminants; Aquifers; Cleaning

19980011980 NERAC, Inc., Tolland, CT USA

Air Sampling Devices. (Latest citations from the Energy Science and Technology Database)

Dec. 1997; In English; Page count unavailable.

Report No.(s): PB98-851165; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only, Microfiche

The bibliography contains citations concerning the design, calibration, and testing of air samplers. Much of the emphasis is placed upon inlet design, portability, and sensing of ultrafine and inhalable particles. Applications include air pollution sampling, well-logging, mine atmospheres, radionuclides, workplace atmospheres, and hazard alarms. Excluded are citations which report on results of monitoring, except when such monitoring is used for comparative evaluations of different types of air samplers.

NTIS

Bibliographies; Sampling; Hygiene; Indoor Air Pollution; Design Analysis; Calibrating; Industrial Wastes; Air Sampling

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GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism. For space radiation see 93 Space Radiation.

19980009277 Alabama A & M Univ., Normal, AL USA

Ionospheric Profiles from Far Ultraviolet Remote Sensing: The Forward Model Annual Report

Tan, A., Alabama A & M Univ., USA; Oct. 1997; 11p; In English

Contract(s)/Grant(s): N00014-97-I-0267

Report No.(s): AD-A329971; AAMU-ONR-97-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The goal of this project is to faithfully reconstruct ionospheric profiles from O+ - e- recombination emissions in the far ultraviolet region of the electromagnetic spectrum as observed from polar orbiting space platforms. Remote sensing of the nighttime ionosphere is a more straightforward process because of the absence of the complications brought about by daytime solar ultraviolet radiation. This, therefore marks the starting point of the present investigation.

DTIC

Remote Sensing; Atmospheric Models; Earth Ionosphere; Far Ultraviolet Radiation; Ultraviolet Detectors; Auroras

19980009322 SRI International Corp., Applied Physical Sciences Lab., Menlo Park, CA USA

Measurement and Analysis of Atmospheric Spectral Optical Depths with NASA Ames Airborne Sunphotometers During TARFOX and ACE-2 Final Report

Livingston, John M., SRI International Corp., USA; Dec. 31, 1997; 8p; In English

Contract(s)/Grant(s): NCC2-938; SRI Proj. 7325

Report No.(s): NASA/CR-97-206708; NAS 1.26:206708; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In accordance with the scope of work of this contract, the following tasks were undertaken and completed during the course of the contract: (1) Participation in the design and development of the 14-channel Ames Airborne Tracking Sunphotometer (AATS-14), including the development and implementation of Visual Basic software for real-time data processing and display and post-acquisition data reduction and analysis. (2) Operation of the six-channel Ames Airborne Tracking Sunphotometer (AATS-6) aboard the University of Washington C-131A during TARFOX and in-field analysis and presentation of data acquired with the AATS-6. (3) Post-mission analysis of data acquired during TARFOX with the AATS-6 and the AATS-14. (4) Pre-TARFOX calibration of the AATS-6 at Mauna Loa Observatory in May 1996, and post-TARFOX calibration of the AATS-6 and AATS-14 at Zugspitze, Germany in October 1996, including analyses of all data sets. (5) Analysis of AATS-14 airborne calibration data acquired on 17 November 1996 during a late afternoon Pelican flight over the central California coast. (6) Operational training, instrument preparation, field coordination, and analysis of shipboard measurements of aerosol optical depth with the AATS-6 during ACE-2. (7) Coordination of data acquisition with the AATS-14 aboard the Pelican during ACE-2 and in-field preliminary data analysis and presentation. (8) Calibration of the AATS-6 and AATS-14 in April/May 1997 at Mauna Loa prior to ACE-2, and post-mission calibration of the AATS-6 at Mauna Loa in August 1997.

Author

Atmospheric Optics; Optical Thickness; Data Acquisition; Examination

19980009408 Paraiba Univ., Dept. of Atmospheric Sciences, Sao Jose dos Campos, Brazil

A Climatological Study of SOIL Moisture at Some Stations in Paraiba

Kumar, Kamada Karuna, Paraiba Univ., Brazil; Bezerra, Virginia de Fatima, Paraiba Univ., Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1436-1438; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

Results of a climatological study of soil moisture at some stations in Paraiba are reported in this paper. Monthly mean temperatures and daily precipitation data for a minimum period of twenty five years is used to compute daily soil moisture values at the stations. Thornthwaite's water balance procedure is used and the computations are carried out for four field capacity values. A first order Markov chain model is applied to the daily soil moisture data and the initial and conditional probabilities of dry and wet soil days are derived. The critical soil moisture content separating a dry from a wet soil day is taken to be half the field capacity value. SOIL moisture averages and probabilities are used to evaluate the crop growing periods, irrigation requirements and the occurrence of dry spells at the stations.

Author

SOIL Moisture; Climatology; Irrigation; Probability Theory; Moisture Content; Markov Chains; Water Balance

19980009730 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Gravitational Wave Search with the Clock Mission

Armstrong, J. W., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 33-40; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Doppler tracking of distant spacecraft is the only method currently available to search for gravitational waves in the low-frequency (approx. 0.0001-0.1 Hz) band. In this technique the Doppler system measures the relative dimensionless velocity $2(\Delta v)/c = (\Delta f)/f(\text{sub } o)$ between the earth and the spacecraft as a function of time, where (Δf) is the frequency perturbation and $f(\text{sub } o)$ is the nominal frequency of the radio link. A gravitational wave of amplitude h incident on this system causes small frequency perturbations, of order h in $(\Delta f)/f(\text{sub } o)$, replicated three times in the observed record (Estabrook and Wahlquist 1975). All experiments to date and those planned for the near future involve only 'two-way' Doppler-i.e., uplink signal coherently transponded by the spacecraft with Doppler measured using a frequency standard common to the transmit and receive chains of the ground station. If, as on the proposed Clock Mission, there is an additional frequency standard on the spacecraft and a suitable earth-spacecraft radio system, some noise sources can be isolated and removed from the data (Vessot and Levine 1978). Supposing that the Clock Mission spacecraft is transferred into a suitable interplanetary orbit, I discuss here how the on-board frequency standard could be employed with an all-Ka-band radio system using the very high stability Deep Space Network station DSS 25 being instrumented for Cassini. With this configuration, the Clock Mission could search for gravitational waves at a sensitivity limited by the frequency standards, rather than plasma or tropospheric scintillation effects, whenever the sun-earth-spacecraft angle is greater than 90 degrees.

Author

Conferences; Gravitational Waves; Clocks; Time Dependence; Radar Tracking

19980009815 NERAC, Inc., Tolland, CT USA

Plate Tectonics and Seafloor Spreading: Latest Citations from Oceanic Abstracts

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-862669; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the theory and applications of plate tectonics to the mechanisms and effects of seafloor spreading. The citations examine the motion of continental plates and its effect on ocean geomorphology and subsea seismic and volcanic activity. The mapping of spreading centers, intracontinental rifts, subduction zones, and fault zones is discussed. References also discuss the use of magnetic and gravitational anomalies to reconstruct the geologic history of specific sites.

NTIS

Bibliographies; Tectonics; Ocean Bottom; Geomorphology; Plateaus; Seismograms

19980009838 Columbia Univ., Dept. of Applied Physics, New York, NY USA

Collisionless Dynamics of the Magnetosphere Final Report

Mauel, Michael E., Columbia Univ., USA; Bhattacharjee, Amitava, Iowa Univ., USA; May 29, 1997; 179p; In English

Contract(s)/Grant(s): F49620-93-I-0071

Report No.(s): AD-A332266; AFOSR-TR-97-0616; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Our research program: (1) demonstrated the relationship between the spectrum and intensity of low-frequency fluctuations and the collisionless transport of energetic trapped particles; (2) verified the applicability of the guiding-center drift Hamiltonian as the foundation for numerical simulation of driven particle flows; (3) derived a unified analytical theory of the electron and ion tearing instability in the presence of all three components of the tail magnetic field in order to identify a trigger for substorms; and (4) investigated the effect of small but finite resistivity on the dynamics of current-sheet formation in the solar corona. All topics originally proposed for study have been addressed by our studies and published within archival journals. In addition, our research uncovered entirely new topics of investigation which are the subject of new and separately funded research activities.

DTIC

Magnetic Fields; Low Frequencies; Trapped Particles; Hamiltonian Functions; Numerical Analysis; Earth Magnetosphere

19980009889 Scripps Institution of Oceanography, La Jolla, CA USA

Coupled Ocean-Atmosphere Interaction and the Development of the Marine Atmospheric Boundary Layer Final Report, 27 Feb. 1995 - 31 May 1997

Rogers, David P., Scripps Institution of Oceanography, USA; Oct. 07, 1997; 9p; In English

Contract(s)/Grant(s): N00014-95-I-0827

Report No.(s): AD-A330047; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this research was to provide an understanding of the processes that control the structure of the marine atmosphere and its interaction with the ocean. In particular, we focussed on understanding the processes that control the exchange of heat and moisture between the ocean and the atmosphere and understanding the physical processes that control the formation, development and decay of stratocumulus clouds in the marine boundary layer. These results have led to new insight into the interactions between cumulus and stratocumulus clouds in a marine layer capped by a temperature inversion. The results are applicable to the development of coupled ocean-atmosphere models where accurate information on the temperature of the sea surface is required. Generally, coupled models fail to resolve accurately the sea surface temperature because they do not include the cloud processes addressed in the present study.

DTIC

Air Water Interactions; Atmospheric Boundary Layer; Marine Environments; Cloud Physics

19980010053 Colorado Univ., Boulder, CO USA

Reactions of Atmospheric Cluster Ions Final Report

Leone, Stephen R., Colorado Univ., USA; Bierbaum, Veronica M., Colorado Univ., USA; Jul. 31, 1997; 7p; In English

Contract(s)/Grant(s): F49620-93-I-0372; AF Proj. 3484

Report No.(s): AD-A329695; AFOSR-97-0428TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

A selected ion flow tube apparatus has been modified to include a well-defined flow drift region and instrumentation for ion modulation and data acquisition. This apparatus was used to measure the first experimental mobilities for several important families of atmospheric cluster ions. Core ions include the nitric oxide cation, ammonium ion, and hydronium ion; solvating ligands include water, ammonia, acetonitrile, and acetone. Several collision gases were examined including helium and nitrogen, as well

as the polar gases, water and acetone. The mobilities of prototypical aromatic species have also been measured and evaluated to distinguish between isomeric structures. Doppler-resolved laser-induced fluorescence measurements of collision-induced rotational alignment of the molecular nitrogen cation drifted in helium have been carried out. A strong correlation was found between the degree of rotational alignment and the velocity subgroup probed along the field direction; the correlation between alignment and velocity increases with increasing field strength. These results are attributed primarily to the change in anisotropy of the relative velocity vector distribution of the nitrogen cation-helium pair with field strength.

DTIC

Atmospheric Chemistry; Mobility; Ions; Clusters

19980010114 Arizona Univ., Dept. of Geosciences, Tucson, AZ USA

Broadband Seismic Recordings of Mining Explosions and Earthquakes in South America *Final Report, 1 Feb. 1994 - 31 Aug. 1996*

Beck, Susan L., Arizona Univ., USA; Wallace, Terry C., Arizona Univ., USA; Feb. 1997; 28p; In English

Contract(s)/Grant(s): F49620-94-I-0147; AF Proj. 2309

Report No.(s): AD-A329679; AFOSR-97-0365TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The signing of the CTBT creates the challenge of monitoring the globe to ensure that there is no nuclear weapons testing. This means that the International Monitoring System must detect, locate, and identify with a high degree of accuracy a large number of seismic events. Individual countries will need to evaluate the events and discriminate man-caused events from naturally occurring seismicity. In regions of high seismicity and mining, the task is difficult without regional characterization and evaluation of the transportability of seismic wave discriminants. South America has regions of active seismicity and mining, yet many of these events are not to be found in the global bulletins. Although South America is not currently a region of geopolitical interest, still it remains a region which is not well understood and in which traditional discriminants do not always work. For example, Chile leads the world in copper production. Thus mining activity occurs on a daily basis and Chile is located above an active subduction zone, hence the discrimination problem. Shallow earthquake and mine blast data (both for sub-surface and open pit) have been very thoroughly analyzed; the data were recorded on a local network. Amplitude ratio have been applied to test the P/S wave discriminate transportability through Chile.

DTIC

Broadband; Earthquakes; Explosions; Nuclear Weapons; P Waves; S Waves; Seismic Waves; Seismology

19980010116 Princeton Univ., Dept. of Civil Engineering and Operations Research, NJ USA

Assessment of Surfactant-Enhanced Bioremediation of SOIs Containing Strongly Sorbing Hydrocarbons *Final Report, 1 Jul. 1994 - 30 Jun. 1997*

Jaffe, Peter, Princeton Univ., USA; Jun. 1997; 39p; In English

Contract(s)/Grant(s): F49620-94-I-0327; AF Proj. 3484

Report No.(s): AD-A329677; AFOSR-97-0371TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Biodegradation of phenanthrene was studied in soil slurry reactors in the presence and absence of a surfactant solution. Results showed that the presence of surfactants slowed the initial biodegradation rate of phenanthrene, but increased the total mass of phenanthrene degraded over a four day period by 30%. A mathematical model was developed to simulate the dynamics of the biodegradation of low solubility hydrocarbons in the presence of soils and surfactants. Processes such as the desorption kinetics of the hydrocarbon from soil, the sorption of the surfactant onto soil and its effect on the sorption of the hydrocarbon, and the bioavailability of the hydrocarbon in different phases of the system are included in the model formulation. The experimental results were measured independently. The model was used to investigate the effect on the overall biodegradation of phenanthrene due to different operating conditions. simulation results showed that there is a system-specific optimum surfactant concentration, above which bioremediation is hindered.

DTIC

Biodegradation; Hydrocarbons; Mathematical Models; Phenanthrene; Simulation; Sorption; Surfactants

19980010520 Colorado Univ., Dept. of Aerospace Engineering Sciences, Boulder, CO USA

Global Plate Velocities from the Global Positioning System

Larson, Kristine M., Colorado Univ., USA; Freymueller, Jeffrey T., Alaska Univ., USA; Philipsen, Steven, Colorado Univ., USA; Journal of Geophysical Research; May 10, 1997; ISSN 0148-0227; Volume 102, No. B5, pp. 9961-9981; In English

Contract(s)/Grant(s): NAG5-1908

Report No.(s): NASA/CR-97-206712; NAS 1.26:206712; Paper-97JB00514; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have analyzed 204 days of Global Positioning System (GPS) data from the global GPS network spanning January 1991 through March 1996. On the basis of these GPS coordinate solutions, we have estimated velocities for 38 sites, mostly located on the interiors of the Africa, Antarctica, Australia, Eurasia, Nazca, North America, Pacific, and South America plates. The uncertainties of the horizontal velocity components range from 1.2 to 5.0 mm/yr. With the exception of sites on the Pacific and Nazca plates, the GPS velocities agree with absolute plate model predictions within 95% confidence. For most of the sites in North America, Antarctica, and Eurasia, the agreement is better than 2 mm/yr. We find no persuasive evidence for significant vertical motions (less than 3 standard deviations), except at four sites. Three of these four were sites constrained to geodetic reference frame velocities. The GPS velocities were then used to estimate angular velocities for eight tectonic plates. Absolute angular velocities derived from the GPS data agree with the no net rotation (NNR) NUVEL-1A model within 95% confidence except for the Pacific plate. Our pole of rotation for the Pacific plate lies 11.5 deg west of the NNR NUVEL-1A pole, with an angular speed 10% faster. Our relative angular velocities agree with NUVEL-1A except for some involving the Pacific plate. While our Pacific-North America angular velocity differs significantly from NUVEL-1A, our model and NUVEL-1A predict very small differences in relative motion along the Pacific-North America plate boundary itself. Our Pacific-Australia and Pacific-Eurasia angular velocities are significantly faster than NUVEL-1A, predicting more rapid convergence at these two plate boundaries. Along the East Pacific Rise, our Pacific-Nazca angular velocity agrees in both rate and azimuth with NUVEL-1A.

Author

Global Positioning System; Tectonics; Plates (Tectonics); Angular Velocity

19980010572 NERAC, Inc., Tolland, CT USA

Earthquakes: Mapping of Seismic Hazards. (Latest Citations from the INSPEC Database)

Mar. 1996; In English

Report No.(s): PB96-866306; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning maps and mapping of seismicity in earthquake-prone areas worldwide. Citations discuss statistical analysis and modeling of seismic mapping, historical seismic events, paleoseismic investigations, seismic occurrences, epicenter mapping, ground motion, earthquake analysis, magnetic anomaly mapping, and analytical techniques to define seismic area events and hazards. Predictive studies based on chemical changes in groundwater and released gases are covered in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Mapping; Seismology

19980010816 Visidyne, Inc., Burlington, MA USA

UV and Optical Spectra Produced by the EXCEDE 3 Experiment Topical Report No. 1

Rieder, R. J., Visidyne, Inc., USA; Keneshea, T. J., Visidyne, Inc., USA; Lepage, A. J., Visidyne, Inc., USA; Rappaport, S. A.; Nov. 1994; 51p; In English

Contract(s)/Grant(s): F19628-93-C-0120; AF Proj. S322

Report No.(s): AD-A323997; VI-2174; PL-TR-94-2272; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A goal of the EXCitation by Electron Deposition (EXCEDE 3) atmospheric energy deposition experiment was to monitor the spectral excitations from the energy deposition profile produced by the - Ampere - 2.5 keV electron beam. During the EXCEDE 3 rocket flight on April 27, 1990, ultraviolet and optical spectra covering the wavelength region between 1800 and 800 Å were measured with two Ebert-Fastie spectrometers. Spectral features have been identified and line production efficiencies have been calculated. Finally, the measured spectra are compared with those obtained from natural aurora.

DTIC

Ultraviolet Spectra; Atmospheric Physics; Experimentation; Light (Visible Radiation)

19980010842 Pennsylvania State Univ., Dept. of Geosciences, University Park, PA USA

Seismic Wave Propagation in Southern and Central Africa Final Report, 1 Nov. 1993 - 30 Apr. 1997

Langston, Charles A., Pennsylvania State Univ., USA; Nyblade, Andrew A., Pennsylvania State Univ., USA; Zhao, Ming, Pennsylvania State Univ., USA; Sep. 18, 1997; 24p; In English

Contract(s)/Grant(s): F49620-94-I-0031

Report No.(s): AD-A332115; AFOSR-97-0637TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Structure of the crust and upper mantle in southern and central Africa is investigated using seismic data from the Global Seismic Network and a special PASSCAL deployment of stations in Tanzania, East Africa. Structure models are developed to understand wave propagation important to issues concerning the verification of the Comprehensive Test Ban Treaty and to also

investigate the tectonic basis for the African 'Superswell', a previously identified region of anomalously high topography covering the southern half of the African continent. Through modeling of regional and teleseismic P, S, and Pn phases it is found that the upper mantle has relatively high velocities down to depths exceeding 700 km.

DTIC

Wave Propagation; Seismic Waves; Earth Crust

19980010901 Mission Research Corp., Santa Barbara, CA USA

Initial Regionalization Efforts for the IMS Seismic Network Topical Report

Bottone, Steven, Mission Research Corp., USA; Fisk, Mark D., Mission Research Corp., USA; Mccartor, Gary D., Mission Research Corp., USA; Carlson, Richard J., Mission Research Corp., USA; Mar. 15, 1997; 51p; In English

Contract(s)/Grant(s): ARPA ORDER-C-325; AF Proj. NM95

Report No.(s): AD-A331462; MRC-R-1539; PL-TR-97-2090; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report, initial efforts are described to establish regional training sets and region-specific distance corrections, for use in seismic event characterization, for 35 Primary and 51 Auxiliary seismic stations of the International Monitoring System (IMS) network. Seismic data considered include Pn/Lg and Pn/Sn in the 2-4 Hz, 4-6 Hz, and 6-8 Hz bands for 2797 regional events collected over a 16-month period at the Prototype International Data Centre (PIDC). Regional training sets for each station consist of the discriminant values for events above mb 3.5 (to minimize potential contamination by mining blasts), within 20 degrees from the station, and with signal-to-noise ratios greater than 1.5. Empirical distance corrections are computed for and applied to each discriminant in each training set separately. Events in the training sets which are determined to be outliers, using a generalized likelihood ratio test, are removed and the distance corrections are iteratively recomputed. The training sets for each station are then categorized in terms of their utility for experimental evaluation of event characterization capabilities at the PIDC. Last, future planned efforts to continue improving the initial region-specific distance corrections and training sets are described.

DTIC

Characterization; Likelihood Ratio; Mining; Prototypes; Seismology; Signal to Noise Ratios

19980010934 Johns Hopkins Univ., Dept. of Civil Engineering, Baltimore, MD USA

Theoretical and Experimental Studies of Microstructural Processes Related to Inelastic Stress-Strain Behavior of Cohesive SOILS Final Report, Aug. 1993 - May 1997

Anandarajah, Annalingam, Johns Hopkins Univ., USA; May 1997; 7p; In English

Contract(s)/Grant(s): F49620-93-I-0265

Report No.(s): AD-A329661; AFOSR-TR-97-0431; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The primary objective of the study was to develop an understanding of the stress strain relationship and other related geotechnical properties of cohesive materials such as clays from a microstructural point of view. In the theoretical area, several theories were developed for quantifying the physico-chemical forces between two clay particles, immersed either in water or in a chemical contaminant. With the aid of these theories, a numerical modeling technique, based on the discrete element method, was developed to study the micromechanical behavior of clays. Experiments were conducted to examine the effects of chemicals on the behavior of cohesive soils. On the basis of the numerical and experimental results, the stress strain behavior of clays is studied from a microstructural view point.

DTIC

Stress-Strain Relationships; Micromechanics; Microstructure; Geotechnical Engineering; Clays; Cohesion

19980011514 Colorado Univ., Mechanical Engineering Dept., Boulder, CO USA

DAA-Based Computational Boundaries for Ground-Shock Analysis, Volume 1, DAA Formulation and Canonical Comparisons, 1 May 1992 - 30 Apr. 1995

Lewis, Brett A., Colorado Univ., USA; Geers, Thomas L., Colorado Univ., USA; Dec. 01, 1997; 89p; In English

Contract(s)/Grant(s): DNA001-92-C-0038

Report No.(s): AD-A332773; DSWA-TR-96-46; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This document describes the formulation and implementation of a computational boundary for elastic solids based on doubly asymptotic approximations (DAA's). DAA's combine high-frequency (wave propagation) and low-frequency (quasi-static) approximations in a systematic manner to produce a relationship between scattered-wave tractions and displacements on the boundary; this relationship approaches exactness at high and low frequencies and provides a smooth transition between. Second-order DAA's for three-dimensional, linear-elastic infinite and semi-infinite media are developed for implementation into general purpose numerical (finite element or finite difference) programs. In addition, modal DAA's for spherical cavities are developed.

Then, DAA results, both general and modal, are compared with analytical and other numerical results for problems involving infinite and semi-infinite media.

DTIC

Numerical Analysis; Finite Element Method; Elastic Properties; Boundaries; Finite Difference Theory; Approximation

19980011613 Canadian Meteorological Centre, Dorval, Quebec Canada

Informal Meeting to Discuss the Application of Atmospheric Modelling to CTBT Verification: Group Report and Proceedings

Jan. 1997; 299p; In English, 15-16 Oct. 1996, Montreal, Quebec, Canada

Report No.(s): PB97-154728; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

A group of experts met in Montreal at the Canadian Meteorological Centre to discuss the application of atmospheric modeling to the verification of the Comprehensive Test Ban Treaty (CTBT). During the first session, the processes required to collect raw meteorological observations through to the three dimensional meteorological modeling of the atmosphere were discussed. During the second session, the current capabilities for modeling the global dispersion of radionuclides in the atmosphere using long range Atmospheric Transport Models (ATMs) were reviewed. Also examined were the possibilities of using such models to determine the source of atmospherically transported radioactive material. In the third session, the possible application of meteorological techniques to CTBT verification were considered. Possible roles for ATMs and visualization tools were examined. Examples were also provided concerning how the dispersion forecasted by current ATMs compared with actual observations. The fourth session was an open discussion which led to the Consensus Group Report, perhaps the most important product of this meeting. An attempt was made to address some of the technical and organization questions that were problematic during the CTBT negotiations.

NTIS

Atmospheric Models; Conferences; Radiation Transport; Nuclear Explosions; Explosives Detection; Radioactive Contaminants; Atmospheric Diffusion

19980011617 NASA Goddard Space Flight Center, Greenbelt, MD USA

Technical Report Series on Global Modeling and Data Assimilation, Volume 13, Interannual Variability and Potential Predictability in Reanalysis Products

Min, Wei, General Sciences Corp., USA; Schubert, Siegfried D., NASA Goddard Space Flight Center, USA; Suarez, Max J., Editor, NASA Goddard Space Flight Center, USA; Dec. 1997; 220p; In English

Report No.(s): NASA/TM-97-104606/Vol-13; NAS 1.15:104606-Vol-13; Rept-97A00357-Vol-13; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The Data Assimilation Office (DAO) at Goddard Space Flight Center and the National Center for Environmental Prediction and National Center for Atmospheric Research (NCEP/NCAR) have produced multi-year global assimilations of historical data employing fixed analysis systems. These "reanalysis" products are ideally suited for studying short-term climatic variations. The availability of multiple reanalysis products also provides the opportunity to examine the uncertainty in the reanalysis data. The purpose of this document is to provide an updated estimate of seasonal and interannual variability based on the DAO and NCEP/NCAR reanalyses for the 15-year period 1980-1995. Intercomparisons of the seasonal means and their interannual variations are presented for a variety of prognostic and diagnostic fields. In addition, atmospheric potential predictability is re-examined employing selected DAO reanalysis variables.

Author

Annual Variations; Climatology; Standard Deviation

19980011644 Army Engineer Waterways Experiment Station, Vicksburg, MS USA

Discrete Network Modeling for Field-Scale Flow and Transport Through Porous Media Final Report

Howington, Stacy E., Army Engineer Waterways Experiment Station, USA; Peters, John F., Army Engineer Waterways Experiment Station, USA; Illangasekare, Tissa H., Colorado Univ., USA; Sep. 1997; 277p; In English

Report No.(s): AD-A332997; WES/TR/CHL-97-21; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Natural soil is a discrete, heterogeneous porous material with many sizes of physical structure. These multi-scale discrete media resist description by differential equations with macroscopic parameters. Constitutive parameters may display an apparent scale dependence or the governing equations may exhibit non-physical behavior. To address these issues, a discrete-medium modeling philosophy is adopted that relies less on complex constitutive theory and more on computational resolution. Specifically, a stochastic, high-resolution, discrete network model is developed and explored for simulating macroscopic flow and conservative transport through macroscopic porous media. Networks can be created to honor macroscopic porosity, effective conductivity, and apparent dispersivity estimates or to honor statistical distributions of small scale conductivities. Flow through a discrete network

compares well with analytical solutions for macroscopic, Darcian fluid flow. Transport through a discrete network differs fundamentally from advection-dispersion theory. However, network-predicted concentration profiles and breakthrough curves are consistent with historical observations of nearly-Gaussian concentration distributions. Dispersion in the network is a natural consequence of its discrete structure. For immiscible flow, network models offer the potential to simulate capillary barriers and macroporous breakthrough phenomena.

DTIC

Heterogeneity; High Resolution; Porosity; Porous Materials; Statistical Distributions; Stochastic Processes

19980011689 Yale Univ., Dept. of Geology and Geophysics, New Haven, CT USA

The Effects of Anisotropy on Regional Wave Propagation Final Report, 15 Nov. 1993 - 30 Apr. 1997

Park, Jeffrey J., Yale Univ., USA; Oct. 1997; 11p; In English

Contract(s)/Grant(s): F49620-94-I-0043

Report No.(s): AD-A332575; AFOSR-TR-97-0639; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Crustal rocks can be highly anisotropic, due to (1) oriented minerals (2) oriented cracks, and/or (3) thin layers of material with different elastic stiffnesses. Crustal Love and Rayleigh surface waves couple strongly for anisotropic structures that do not possess a vertical axis of symmetry, and cause explosion to generate significant shear motion on the transverse component of seismograms. We developed theory and 1-D layered-media synthetic seismogram codes for anisotropy with an arbitrary axis of symmetry. One code version can synthesize surface waves with periods 100 greater than T greater than 0.4 sec. Another code version can synthesize teleseismic body wave reverberations up to 5 Hz. We determined that a tilted axis of symmetry enhances Love-Rayleigh coupling and the scattering of P-waves (compressional) to S-waves (shear). Using P-S scattering, we found evidence for strong (greater than 10%) anisotropy in the deepest and shallowest crustal layers beneath seismic station ARU (Arti, Russia), an 'open' seismic observatory proximal to the Novaya Zemlya nuclear test site. We also developed a wavelet-base signal processing algorithm that picks out correlated 'signals' from uncorrelated 'noise' in an optimally bandpassed manner using the Terrascope regional array in California, we applied this algorithm to reconstruct, for a single correlated signal, anomalous amplitudes and polarizations at individual stations, allowing more 'signal' to be recovered than via standard 'stacking.'

DTIC

Wave Propagation; Anisotropy; Rocks; Rayleigh Waves; Surface Waves; Wavelet Analysis; Signal Processing; Crustal Fractures

47

METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

19980009260 Oregon State Univ., Coll. of Oceanic and Atmospheric Sciences, Corvallis, OR USA

Marine Boundary-Layer Parameterizations for Large-Scale Models: Data Analysis and Verification Final Report, 1 Sep. 1993 - 31 Dec. 1996

Mahrt, Larry, Oregon State Univ., USA; Dec. 31, 1996; 10p; In English

Contract(s)/Grant(s): F49620-93-I-0497

Report No.(s): AD-A329664; AFOSR-TR-97-0471; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The data sampling and analysis techniques associated with research under this AASERT grant will aid in better estimates of fluxes from observations, a requirement for model verification. The new analysis techniques allow decomposition of the flow into localized modes which are more natural to boundary layer problems compared to the usual Fourier decomposition. The analysis techniques are applicable to observational data sets as well as numerical output. The usual assumption of alignment of the surface stress and surface wind vector was reexamined. This assumption appears to break down with significant temperature advection. This problem was examined in terms of tower data collected in the coastal zone by the Risoe National Laboratory (Denmark). The usual formulation of the surface heat flux in models is inconsistent in that the aerodynamic temperature required for Monin-Okukhov similarity theory is replaced by the surface radiation temperature. The aerodynamic temperature is not readily available and numerous empirical fixes have been suggested to dose the system. The approach here documents these problems by relating the evaporative fraction to remotely sensed information using data from the Boreal Ecosystem-Atmosphere Study and the California Ozone Deposition Experiment.

DTIC

Heat Flux; Parameterization; Marine Environments; Remote Sensing; Evaporation; Atmospheric Boundary Layer

19980009398 Sociedade Brasileira de Meteorologia, Rio de Janeiro, Brazil

The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities, Volume 2 Os Benefícios das Modernas Técnicas de Previsão de Tempo e Clima Para as Atividades Socio-Economicas

The Benefits of the Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; 634p; In Portuguese; In English; 9th; Brazilian Congress of Meteorology, 6-13 Nov. 1996, Campos do Jordao, Brazil; Sponsored by Sociedade Brasileira de Meteorologia, Brazil; Also announced as 19980009399 through 19980009411; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

Topics covered include: (1) Non-line Mesoscale Convective Systems; (2) Reduced Filter Approaches to Data Assimilation; (3) Wavelet Analysis; (4) Open Water Evaporation; (5) Leaf Area Effects; (6) Pollutant Transport; (7) Surface Resistance; (8) Cold Surges; (9) Instability of Ultra-long Waves; (10) SOIL Moisture Study; (11) Altitudinal Gradient of Maximum Temperature; (12) Air Temperature Prediction; and (13) River Trends Prediction.

Derived from text

Weather Forecasting; Climate; Wavelet Analysis; Water; SOIL Moisture; Mesoscale Phenomena; Gradients; Data Reduction; Evaporation; Pollution Transport

19980009399 Universidade Federal de Pelotas, Rio Grande do Sul, Brazil

Internal Structure of Non-Line Mesoscale Convective System in Southern Brazil

Abdoulav, Sanjar, Universidade Federal de Pelotas, Brazil; Starostin, Anatoli, Universidade Federal de Pelotas, Brazil; Lenskaia, Olga, Universidade Federal de Pelotas, Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 883-886; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

The internal structure of 14 Non-line Mesoscale Convective Systems (NLMCS) with severe convection (echo intensities more than 55 dBZe in some stage of development) that occurred in Southern Brazil are studied. The NLCS reflectivity field structure is complex and strongly evolves with time, and frequently is called as 'the chaotic arrangement of convective cells and stratiform precipitation'. For analysis of this structure, the method of composite is used for reflectivity structure in lagrangean coordinates. The reflectivity field is dislocated with system velocity (passive translation of cells) and is integrated during life of NLCS to one composite image. In contrast to 'chaotic' distribution of intense echoes on instant radar images, the time integrated distribution of these echoes in lagrangean coordinate system moving with mean tropospheric wind is quit organized. The strongest echoes of NLCS are concentrated to three mesoscale ensembles: small-Beta (approximately 30 km), large-Beta (approximately 100 km) and small-alpha (approximately 250-300 km). The larger ensembles consist of the smaller ensembles, that are distributed in space more or less regularly. The intensity of NLCS also is quasi-periodic with a period of 1 and 3-4 hours.

Author

Composite Structures; Radar Imagery; Image Processing; Temporal Distribution; Photomapping; Brazil; Convection Cells

19980009402 Instituto Nacional de Pesacais Espaciais, Sao Jose dos Campos, Brazil

Wavelet Analysis Optimized to the Time-Scale: Studying Gte-Able-2b Turbulent Data Above and Below the Canopy of the Amazonian Rain Forest

Nowosad, Alexandre G., Instituto Nacional de Pesacais Espaciais, Brazil; Prasad, Gannabathula S. S. D., Instituto Nacional de Pesacais Espaciais, Brazil; Sa, Leonardo, D. A., Instituto Nacional de Pesacais Espaciais, Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1145-1147; In English; Also announced as 19980009398

Contract(s)/Grant(s): FAPESP-93/2715-1; CNPq-300995/92-0; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

In this work we study the turbulent signal measured above and below the Amazon Rain Forest (GTE-ABLE-2B Experiment) during daytime, in a dry day, in stable conditions using wavelet transforms. Here there has been a systematic preoccupation with the scale optimization of the analysis. Such methodology results in better analysis results and can indicate important physical aspects of the turbulent exchange processes. In this we compare the data from above and below the canopy, with the objective of better understanding the role of the Rain Forest's canopy as a physical barrier to the exchange processes of heat and momentum.

Author

Wavelet Analysis; Rain Forests; Amazon Region (South America); Stability; Turbulence

19980009403 Paraiba Univ., Dept. of Atmospheric Sciences, Sao Jose dos Campos, Brazil

Open Water Evaporation at Some Stations in Paraiba

Kumar, Kamada Karuna, Paraiba Univ., Brazil; Bezerra, Virginia de Fatima, Paraiba Univ., Brazil; The Benefits of Modern Tech-

niques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1224-1225; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

In dry regions like northeast Brazil accurate estimation of evaporation rates from water surfaces is a matter of much significance. Penman's method is extensively used to determine open water evaporation. However, the data necessary is often not available. Linacre has suggested various simplified expressions whose data requirements are much less stringent. Results of a study of open water evaporation at some stations in Paraiba based on Linacre's approach are reported in this paper.

Author

Evaporation Rate; Brazil; Water; Evaporation

19980009404 State Univ. of New York, Atmospheric Science Research Center, Albany, NY USA

Leaf Area Influence on Surface Layer in a Deciduous Forest, Part I, Site Description

Sakai, Ricardo K., State Univ. of New York, USA; Fitzjarrald, David R., State Univ. of New York, USA; Moore, Kathleen E., State Univ. of New York, USA; Sicker, John W., State Univ. of New York, USA; Munger, William, Harvard Univ., USA; Goulden, Michael L., Harvard Univ., USA; Wofsy, Steven C., Harvard Univ., USA; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1244-1246; In English; Also announced as 19980009398

Contract(s)/Grant(s): DE-FC03-90ER-61010; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

A study over a deciduous forest located in middle Massachusetts (USA) has been performed to examine the role of leaves in the forest-atmosphere interaction. Due to the seasonal presence of leaves, a deciduous forest is a 'good laboratory' to study this interaction. In this first part, a description of a 30 m micrometeorological tower as well a qualitative description of some meteorological parameters are presented. The presence of leaves affects the forest in several ways. There is a decrease of upward PAR (Photosynthetically Active Radiation) due to absorption of visible light in the canopy. Water vapor concentration increases, and the CO₂ concentration decreases in the surface layer as the canopy starts to be foliated. The physical presence of the leaves is felt in other quantities such as the global albedo and the subcanopy environment.

Author

Forests; Surface Layers; Carbon Dioxide Concentration; Meteorological Parameters; Water Vapor; Leaves; Electromagnetic Absorption; Leaf Area Index

19980009405 State Univ. of New York, Atmospheric Science Research Center, Albany, NY USA

Leaf Area Influence on Surface Layer in a Deciduous Forest, Part 2, Detecting Leaf Area and Surface Resistance During Transition Seasons

Sakai, Ricardo K., State Univ. of New York, USA; Fitzjarrald, David R., State Univ. of New York, USA; Moore, Kathleen E., State Univ. of New York, USA; Sicker, John W., State Univ. of New York, USA; Munger, William J., Harvard Univ., USA; Goulden, Michael L., Harvard Univ., USA; Wofsy, Steven C., Harvard Univ., USA; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1247-1250; In English; Also announced as 19980009398

Contract(s)/Grant(s): DE-FC03-90ER-61010; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

Temperate deciduous forest exhibit dramatic seasonal changes in surface exchange properties following on the seasonal changes in leaf area index. The canopy resistance to water vapor transport $r_{(sub\ c)}$ decreased abruptly at leaf emergence in each year but then also continued to decrease slowly during the remaining growing season due to slowly increasing LAI. Canopy resistance and PAR-albedo (albedo from photosynthetically active radiation) began to increase about one month before leaf fall with the diminishment of CO₂ gradient above the canopy as well. At this time evaporation begun to be controlled as if the canopy were leafless.

Author

Leaf Area Index; Annual Variations; Surface Properties; Surface Layers; Water Vapor; Evaporation; Forests

19980009406 Instituto Nacional de Pesquisas Espaciais, Centro de Previsao de Tempo e Estudos Climaticos, Sao Jose dos Campos, Brazil

Cold Surges in the Tropical and Extra Tropical South America: Three Cases of Winter of 1994

Marengo, Jose A., Instituto Nacional de Pesquisas Espaciais, Brazil; Cornejo, Angel G., Instituto Nacional de Pesquisas Espaciais, Brazil; Satyamurty, Prakky, Instituto Nacional de Pesquisas Espaciais, Brazil; Nobre, Carlos A., Instituto Nacional de Pesquisas

Espacias, Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1337-1339; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

We investigate the surges of polar air that occasionally propagate into southeastern Brazil during winter time and are harmful to coffee production, because of the freezing conditions related to them. The cooling is also felt in southern and with less intensity in the western Amazonia. We study three events of the winter of 1994: 26 June, 9 July and 4 August. These frost events caused a sharp drop in the coffee production and similarly dramatic increases in the world coffee prices. We performed a study of synoptic and climatic aspects of these cold surges episodes by using daily surface climatic observations for the June case study, and an analysis the dynamic aspects of this cold episode and to study the cooling mechanisms by using the 4-times a day surface and upper-air NCEP/NCAR reanalysis, in order to look for possible predictors.

Author

Tropical Regions; Upper Atmosphere; Climatology; Winter; Freezing; Frost; Surges

19980009407 Instituto Nacional de Pesquisas Espaciais, Centro de Previsão de Tempo e Estudos Climáticos, São José dos Campos, Brazil

The Instability of Ultra-Long Waves During the Formation of Long-Term Weather Anomalies

Pisnitchenko, Igor A., Instituto Nacional de Pesquisas Espaciais, Brazil; Figueroa, Silvio Nilo, Instituto Nacional de Pesquisas Espaciais, Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1415-1418; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

The ultra-long waves of the main meteorological fields (geopotential, velocity, temperature, ozone) play a very important role in the formation of weather and climate regimes of the atmospheric circulation. There is a obvious correlation between the events of the blocking formation and the values of the amplitude of the first mode of geopotential. In this work we have investigated the relationship between the vortex formation in the Eastern Pacific and a blocking episode during 19/12-26/12/1996 near 180W. We have found that this blocking is associated with large amplitude of the wave with zonal number 4, and the formation of the vortex is associated with this blocking. Arriving in South America and interacting with the South Convergence Zone (SACZ) this vortex is converting into a blocking vortex pair over the South of Brazil. Very strong precipitation was generated over Southern Brazil at that time. In order to determine the role of the baroclinic instability for the increase of ultra-long waves we have used geostrophic equation type 11 and investigated stability of zonal flow in more common nonlinear formulation. We found that the growth of the amplitude of planetary waves in our case was not associated with this type of instability.

Author

Planetary Waves; Atmospheric Circulation; Baroclinic Instability; Flow Stability; Geopotential; Weather; Anomalies

19980009409 Paraíba Univ., Dept. of Atmospheric Sciences, São José dos Campos, Brazil

A Note on the Altitudinal Gradient of Maximum Temperature at Some Stations in India

Kumar, Kamada Karuna, Paraíba Univ., Brazil; Bezerra, Virginia de Fátima, Paraíba Univ., Brazil; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1438-1441; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

Estimation of climatic conditions in upland areas from a knowledge of low land climatic conditions is an interesting problem in physical climatology. Spatial and time variations in air temperature are generally much smaller than variations in other meteorological parameters. Results of a study of the seasonal variation of the altitudinal gradient of maximum temperature at some stations in India are presented in this paper.

Author

Meteorological Parameters; Climatology; Temperature Gradients

19980009410 Institute of Meteorology, Havana, Cuba

Prediction of the Air Temperature Stable Pass Over 25°C and the Rainy Season Start in Cuba

Díaz, Leticia Hernández, Institute of Meteorology, Cuba; Escalante, César A. Terrero, Institute of Meteorology, Cuba; The Benefits of Modern Techniques for Weather Forecasting and Climate for Socio-Economical Activities; 1996; Volume 2, pp. 1464-1468; In English; Also announced as 19980009398; No Copyright; Avail: Issuing Activity (Sociedade Brasileira de Meteorologia, 21949-900 Rio de Janeiro RJ, Brasil), Hardcopy, Microfiche

In Cuba, since 1992 a method has been used to predict air temperature stable pass over 25°C (DT) and rainy season start (DP). In that method, DT and DP are predicted for one station (Santiago de las Vegas) using a quadratic regression equation. Then, the

forecast is extended to another 34 stations by means of linear regression. In this paper, we applied the above mentioned method to obtain a preliminary DT. Then using between group analysis (BGA) techniques for many sets of data (MSOD), an equation for a characteristic region was obtained. After that, taking into account local anomalies, a functional form that allows to forecast DT in any point of Cuba was found. This functional form depends on the result for Santiago de las Vegas station and the height, latitude and longitude of the analyzed place. Considering the air temperature stable pass over 25EC as an indicator of the rainy season start, an analogous formula for DP was obtained. The robustness of the results was checked using the theory of replication.

Author

Forecasting; Atmospheric Temperature; Rain; Quadratic Equations; Stability; Robustness (Mathematics)

19980009772 Army Research Lab., Information Science and Technology Directorate, Adelphi, MD USA

Evaluation of an Atmospheric Microclimate Model Final Report, Nov. 1995 - Jun. 1997

Tunick, Arnold D., Army Research Lab., USA; Nov. 1997; 36p; In English

Report No.(s): AD-A332273; ARL-TR-1459; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the Glossary of Meteorology (Huschke, 1959), 'microclimate' is defined as 'the fine climate structure of the air space which extends from the very surface of the earth to a height where the effects of the immediate character of the underlying surface no longer can be distinguished from the general local climate (mesoclimate or macroclimate).' In modeling microclimate, one simulates the characteristics of the atmospheric surface and boundary layers. Its time-varying behaviors are related, albeit nonlinearly, to radiative heating and cooling, changes in water content of both the air and soil, terrain, land use, and ground cover. Numerical computer models attempt to simulate the microphysical processes of microclimate for a wide range of applications. In defense technology, microclimate data can be applied operationally, as well as in support of planning, environmental assessment, and research.

DTIC

Evaluation; Meteorology; Atmospheric Models

19980009792 Army Engineer Waterways Experiment Station, Coastal Hydraulics Lab., Vicksburg, MS USA

Index and Bulk Parameters for Frequency-Direction Spectra Measured at CHL Field Research Facility Final Report, Sep. 1995 - Aug. 1996

Long, Charles E., Army Engineer Waterways Experiment Station, USA; Sep. 1997; 123p; In English

Report No.(s): AD-A330008; WES/MP/CHL-97-8; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report indexes parameters of and describes a means of access to 2,812 wind wave frequency-direction spectral observations obtained at the U.S. Army Engineer Waterways Experiment Station Field Research Facility from September 1995 to August 1996. An iterative maximum likelihood algorithm is used to estimate directional spectra using signals from a spatial array of 15 bottom-mounted pressure sensors in about 8 m of water, approximately 900 m offshore. Parameters include characteristic wave height, spectral peak frequency and corresponding peak period, peak wave direction, directional spread, and reflection coefficient. Time series graphs of these parameters, as well as local winds, illustrate the salient climatology.

DTIC

Air Water Interactions; Maximum Likelihood Estimates; Pressure Sensors; Research Facilities; Spectra; Spread Reflection; Time Series Analysis; Waterways

19980010020 Federal Aviation Administration, Atlantic City, NJ USA

Weather System Processor (WSP) Test and Evaluation Master Plan (TEMP)

Martinez, Radame, Federal Aviation Administration, USA; Lee, Tai, Federal Aviation Administration, USA; Stretcher, Baxter, Federal Aviation Administration, USA; Adamskyj, Cindy, Federal Aviation Administration, USA; Aug. 1997; 77p; In English
Report No.(s): AD-A330010; DOT/FAA/CT-TN97/13; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This Test and Evaluation Master Plan (TEMP) describes technical and operational testing requirements, general methodology, and responsibilities for the comprehensive system testing of the Weather System Processor (WSP) National Airspace System (NAS) subsystem. This TEMP further establishes an agreement between the developing organization, the user, and the tester to support acquisition decisions, by identifying areas of technical and operational risk, by defining a comprehensive plan to address and resolve the risk, and by providing a structure for reporting the results. The WSP Test and Evaluation Program will ensure that the WSP fulfills the Mission Needs Statement (MNS), meets the requirements in the WSP Requirements Document (RD), applicable NAS requirements, the WSP Specification, applicable Interface Requirements Documents (IRDs), and relevant contractor generated documents that have been approved by the Government.

DTIC

National Airspace System; Contractors; Weather; Specifications

19980010330 World Climate Programme, World Climate Programme, Geneva, Switzerland

Meeting of the CCI Working Group on Climate Data

Jul. 1997; 82p; In English; Climate Data, 30 Jan. 1995 - 3 Feb. 1995, Geneva, Switzerland

Report No.(s): WCDMP-33; WMO-TD-841; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

Until relatively quite recently, climate data management in developing countries was not a priority task as most meteorological activities were basically geared to support air and water transport operations. However, the emerging climate data needs for the agricultural, water resources, environment and other sectors have exerted great influence on the meteorological services and this has in turn compelled them to give climate data management a deserving attention. The following may be a useful summary of what obtains or needs to be done. (1) Need to take broad context of climate data management involving all major components, viz: (a) Station Networks, including the delicate but necessary selection of Reference Climatological Stations; Network densities inadequate in many countries; (b) Data Collection: Especially in terms of timeliness in respect of non-synoptic stations; (c) Quality Control: Procedures available through CLICOM are quite good but by no means exhaustive; (d) Archiving in suitable formats; (e) Retrieval and subsequent Processing into usable forms; (2) Users Needs: Need to satisfy present user demands as well as those foreseen in the future; (3) Mechanism for co-ordination of the management of selected priority datasets or 'regionally important elements' for ease of servicing regional and international scale requests for data. However, because of the emerging concerns arising from commercialisation, this may need to be preceded by some form of a memorandum of understanding or protocol. Most countries in RA-1 seem to commonly recognise that daily Rainfall, Maximum and Minimum temperature might comprise such a dataset; (4) Interfacing of CLICOM installations with real-time national meteorological data communications systems; (5) Further Training in modern Methods of Data Management, including CLICOM.

Derived from text

Data Management; Meteorological Parameters; Climatology; Quality Control; Protocol (Computers); Meteorological Services; Conferences

19980010524 Florida State Univ., Dept. of Meteorology, Tallahassee, FL USA

Prediction of Cloud Cover with a Global Model Final Report, 1 Jun. 1993 - 31 May 1997

Krishnamurti, T. N., Florida State Univ., USA; Oct. 27, 1997; 5p; In English

Contract(s)/Grant(s): F49620-93-I-0351

Report No.(s): AD-A332298; FSU-1337-682-27; AFOSR-TR-97-0624; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This is a study of diagnostic cloud schemes to examine the variability of cloud fractions in monsoon systems. Includes simulation the middle tropospheric cyclone (MTC) of the Asian monsoon. Cloud radiation is a key factor in the thermodynamic control of the local east-west circulation. Also showed is the coalescence of small vorticity elements; these coalesce to form a parent large scale mid-tropospheric cyclone. The study of thermodynamics of this system constitutes this research. Various methods for determining precipitation rates associated with the MTC are included and precipitation is shown to be due to convective processes rather than stable processes which are characterized by the general monsoon pattern.

DTIC

Cloud Cover; Coalescing; Convection; Cyclones; Monsoons; Thermodynamics; Troposphere

19980010605 Naval Postgraduate School, Monterey, CA USA

Observations of Mesoscale Convective Systems During Tropical Cyclone Genesis

Finta, Christopher A., Naval Postgraduate School, USA; Mar. 1997; 91p; In English

Report No.(s): AD-A331916; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

A better understanding of the role mesoscale convective systems (MCS) play in the formation stages of tropical cyclones will increase the ability to predict their occurrence and motion. This thesis employs high-resolution satellite imagery to observe the interaction between MCSs and their environment. Specifically, thirteen cases of tropical disturbances that eventually developed into tropical cyclones are analyzed to determine the role of MCSs in increasing the system organization. Following two conceptual models developed during the Tropical Cyclone Motion (TCM-93) mini-field experiment, each tropical cyclone is classified according to the relative importance of MCS activity to its development. Both conceptual models are verified through analysis and a third model is created to account for tropical cyclone developments that share features of the previous two models. An alternate approach is proposed for determining tropical system organization using only visible and infrared satellite imagery.

DTIC

Mesoscale Phenomena; Tropical Storms; Cyclones; Satellite Imagery

19980010807 Woods Hole Oceanographic Inst., Dept. of Applied Ocean Physics and Engineering, MA USA
The Impact of Sea-Spray Droplets on the Surface Energy Budget Under High Wind Speeds Over Waves *Final Report, 15 Oct. 1994 - 14 Oct. 1996*

Edson, James B., Woods Hole Oceanographic Inst., USA; Nov. 01, 1997; 37p; In English

Contract(s)/Grant(s): N00014-95-I-0021

Report No.(s): AD-A331896; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The project involved an investigation of the effects of evaporating sea-spray under high wind conditions. These investigations were accomplished using an interactive Eulerian-Lagrangian model developed by the PI. The interactive model was validated using data collected during the 1988 CLUSE program. This work has demonstrated that the combined model accurately simulates the turbulent transport of evaporating droplets. In additions, this paper advanced the state-of-the-art in droplet research by demonstrating that the potential for substantial modification of the surface energy budget exists if the presence of waves acts to eject the droplets higher and/or disperse the droplets more efficiently. The model predicted that the contribution of the sea spray on the latent heat flux is at least 10% of the total under high wind speed conditions. The second part of this investigation has involved modifications to the Eulerian portion of the code to include a wavy lower boundary. The validation of this model is being accomplished through comparisons with an open ocean data set collected aboard the R/P FLIP during the 1995 Marine Boundary Layers Experiment. These observations are now being used to improve the boundary conditions and closure schemes to simulate the flow over waves as realistically as possible.

DTIC

Surface Energy; Energy Budgets; Experimentation; Evaporation

19980010845 Stockholm Univ., Dept. of Metrology, Sweden
Experiments with a Cirrus Parameterization Scheme in HIRLAM

Zurovac-Jevtic, D., Stockholm Univ., Sweden; Mar. 1996; 40p; In English

Report No.(s): PB96-173257; DM-73; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A parameterization scheme for the formation and maintenance of cirrus, as a new part of the cloud parameterization scheme presented in Sundqvist et al. (1989), has been developed. The scheme is implemented in the High-Resolution Limited Area Model (HIRLAM) and a case study performed. Using cloud water, specific humidity, and temperature as prognostic variables, the cirrus scheme is based on relaxation of the cloud water and specific humidity towards a quasi-steady state, with a relaxation time of order 30 minutes.

NTIS

Cirrus Clouds; Humidity; Ice Clouds; Ice Formation; Parameterization; High Resolution

19980010855 Science Applications International Corp., Washington, DC USA
National Hurricane Center NHC83 Model (NHC90) Revised

Neumann, C. J., Science Applications International Corp., USA; McAdie, C. J., National Hurricane Center, USA; Nov. 1991; 42p; In English

Report No.(s): PB96-174305; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The National Hurricane Center (NHC) statistical-dynamical NHC83 model was introduced operationally for the 1993 hurricane season. Two approaches to potential improvement are suggested. The first involves maintaining the basic integrity to the model but using deep-layer-mean winds rather than deep-layer-mean geopotential heights as the main source of predictive information. The second method involves retaining the geopotential heights as predictors but revising the model based upon an evaluation of NHC83 1983-1988 error patterns. This study reports on a revision to the model using the second of the two approaches; that is, maintaining the height fields but addressing identifiable deficiencies. Forecast errors obtained from development data, when compared to those of the original NHC83 model, suggest that the new model (NHC90) should out perform NHC83.

NTIS

Mathematical Models; Hurricanes; Forecasting; Predictions

19980010990 Computational Physics, Inc., Fairfax, VA USA
Retrieval Algorithms for Atmosphere Data Assimilation *Final Report, 7 May - 7 Nov. 1997*

Lumpe, Jerry D., Computational Physics, Inc., USA; Dec. 05, 1997; 24p; In English

Contract(s)/Grant(s): N00024-97-C-4127

Report No.(s): AD-A332581; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report details the development of algorithms for the purpose of assimilating multiple satellite remote sensing data sets of important geophysical parameters into instrument-independent three-dimensional gridded distributions. The assimilation

problem has been formulated and solved as a general nonlinear retrieval problem, using the theory of optimal estimation. A detailed description of the method, and the specific structures resulting from its application to data assimilation, are provided. The algorithms have been tested on simulated satellite data sets for the specific problem of creating global ozone mixing ratio distributions from assimilation of satellite limb-viewing occultation and emission data. The results of these simulations clearly demonstrate the technical feasibility of the proposed approach. The potential applications of a general, rigorous data assimilation algorithm are widespread because of the increasing dependence on, and sophistication of, satellite remote sensing data in both the defense and civilian sectors. Examples include the suite of polar orbiting satellites operated by DMSP and NOAA which provide climatological data for operational weather prediction, multi-platform scientific missions such as NASA's planned EOS program, and commercial earth remote sensing programs such as LANDSAT and the French SPOT program.

DTIC

Satellite Imagery; Remote Sensing; Algorithms

19980011507 Naval Research Lab., Stennis Space Center, MS USA

A Three-Year Climatology of Waves and Winds in the Gulf of Mexico *Final Report*

Teague, William J., Naval Research Lab., USA; Hwang, Paul A., Naval Research Lab., USA; Jacobs, Gregg A., Naval Research Lab., USA; Thompson, E. F., Coastal Engineering Research Center, USA; Wang, David W., Computer Sciences Corp., USA; Nov. 14, 1997; 22p; In English

Report No.(s): AD-A332754; NRL/MR/7332--97-8068; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Precise wave and wind climatologies from satellite data are now possible. Significant wave height, wave period, wave steepness, and wind speed over the Gulf of Mexico have been derived from the NASA altimeter on the TOPEX/POSEIDON satellite for 1992-1995. TOPEX/POSEIDON ground tracks in this region are approximately 300km apart and have an along track resolution of about 7 km. Climatological maps of the Gulf of Mexico for these parameters have been generated for annual and seasonal time periods. Strong seasonality is clearly shown from these maps. Wave heights and wind speeds are found to increase from east to west across the Gulf. The fall and winter seasons are found to be most intense, with the largest significant wave heights and highest wind speeds observed during the fall season of 1995. Summer seasonal values were typically very low. The satellite data compare well with the National Data Buoy Center (NDBC) in situ buoy data and Army Corps of Engineers Wave Information Studies (WIS) Gulf of Mexico wave hindcast model statistics. Statistics of wave parameters derived from TOPEX/POSEIDON are improved over earlier satellite missions due to the improvements in altimeter accuracy and longer satellite lifetime.

DTIC

Climatology; Seasons; Wind Velocity; Poseidon Satellite; Mathematical Models; Buoys

19980011520 NASA Dryden Flight Research Center, Edwards, CA USA

Atmospheric Considerations for Uninhabited Aerial Vehicle (UAV) Flight Test Planning

Teets, Edward H., Jr., Analytical Services and Materials, Inc., USA; Donohue, Casey J., Analytical Services and Materials, Inc., USA; Underwood, Ken, AeroVironment, Inc., USA; Bauer, Jeffrey E., NASA Dryden Flight Research Center, USA; Jan. 1998; 18p; In English; 36th; Aerospace Sciences Meeting and Exhibit, 12-15 Jan. 1998, Reno, NV, USA; Sponsored by American Inst. of Aeronautics and Astronautics, USA

Contract(s)/Grant(s): RTOP 242-33-02-00-23

Report No.(s): NASA/TM-98-206541; H-2220; NAS 1.15:206541; AIAA Paper 98-0748; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Atmospheric considerations are a key element in support of uninhabited aerial vehicle (UAV) flight testing. The local atmospheric environment (wind speed and direction, wind shear, temperature, precipitation, and turbulence) must be characterized and understood. The primary objective is to ensure safety of the vehicle, test range, and ground assets. The generalized atmospheric behavior for any potential flight operations site is best described by combining the local seasonal climatology, daily upper atmospheric wind and temperature profiles, and hourly surface and low-level wind observations. This paper describes a continuous forecast update process based on monitoring atmospheric turbulence with surface and low-level wind for the support of UAV flights. Updates ensure the most current available data needed for mission planning. Each mission plan is developed so as not to exceed operation limits because of weather conditions. This paper also discusses climatology, weather forecasts, and day-of-flight weather monitoring for planning of uninhabited aerial vehicle missions.

Author

Pilotless Aircraft; Atmospheric Turbulence; Mission Planning; Climatology; Weather Forecasting

19980011590 World Meteorological Organization, World Climate Programme, Geneva, Switzerland

Summary Notes and Recommendations Assembled for CC1-XII from Recent Activities Concerning Climate Data Management

Jul. 1997; 50p; In English

Report No.(s): WCDMP-30; WMO-TD-832; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Topics considered include: Expert Meeting on the Future Evolution of Climate DataBase Management Systems (September 1994); Summary Report of the WMO Dare 4 Planning Meeting (Bridgetown, Barbados 26-28 July 1995); Recommendations of the RA 3 Clicom Expert Meeting (Santiago, Chile, 6-18 November 1995); Expert Meeting for the Preparation of the WMO Guide on the Preservation and Management of Climate Data in Developing Countries (Arzier, Switzerland 28-31 May 1996); Meeting on Clicom Implementation and Development; RA V Roving Clicom/Clips Seminar Brunei Darussalam, Papua New Guinea, Solomon Island, Vanuatu, Fiji Islands (17 November to 15 December 1996); Excerpt from Draft Report of the CIMO Working Group on Surface Measurements Dealing with Automated Measurements (Silver Springs, USA, 14-18 April 1997); RA I Seminar on Climate Applications and Services Focusing on Clicom and Clips for Select French-Speaking Countries of RA I (ACMAD, Niamey, Niger, 10-21 March 1997).

Derived from text

Procedures; Data Base Management Systems; Climate; Automatic Test Equipment

19980011674 Dugway Proving Ground, Meteorology and Obscurants Div., UT USA

Surface Effects on Evaporation, Recirculation, and Dispersion in Light Winds Final Report, Jul. 1995 - Aug. 1997

Biltoft, Christopher A., Dugway Proving Ground, USA; Sep. 1997; 115p; In e

Report No.(s): AD-A332896; DPG-TR-97-065; DPG/JCP-97/016; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

A joint U.S., UK, and Canadian Evaporation, Recirculation, and Dispersion in Light winds trials program was conducted at U.S. Army Dugway Proving Ground in July-August 1995. Program objectives were to: (1) obtain evaporation data from chemical agent simulants on sand, concrete, and aluminum surfaces; (2) document the effects of obstacle geometry and atmospheric stability on the accumulation and retention of material entrained into obstacle wakes; and (3) examine near-surface dispersion in low winds. The program produced data sets that can be used to validate evaporation and urban dispersion models, and provided detailed descriptions of dispersion in low winds. Based on an analysis of the data, new turbulence and stability indices are proposed to characterize surface layer dispersion.

DTIC

Surface Roughness Effects; Evaporation; Circulation; Dispersions; Simulation; Chemical Indicators

19980011679 Massachusetts Inst. of Tech., Lincoln Lab., Lexington, MA USA

The Westford Water Vapor Experiment: Use of GPS to Determine Total Precipitable Water Vapor

Coster, Anthea J., Massachusetts Inst. of Tech., USA; Niell, Arthur E., Massachusetts Inst. of Tech., USA; Burke, Hsiao-hua K., Massachusetts Inst. of Tech., USA; Czerwinski, Mark G., Massachusetts Inst. of Tech., USA; Dec. 17, 1997; 47p; In e
Contract(s)/Grant(s): F19628-95-C-0002

Report No.(s): AD-A332947; MIT-TR-1038; ESC-TR-97-060; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Westford Water Vapor Experiment (WWAVE) was designed to measure the temporal and spatial variability of the total precipitable water vapor (PWV) over an area defined by an approximate 25 km radius centered on the Haystack Observatory in Westford, MA. PWV is defined as the height of liquid water that would result from condensing all the water vapor in a column from the Earth surface to the top of the atmosphere. The main experiment was conducted from 15-30 August 1995, and a variety of different techniques were used to measure the water vapor, including: radiosondes, launched two to three times daily from one location; a water vapor radiometer (and 11 Global Positioning System (GPS) receivers separated by 0.5 to 35 km. The data were either collected by A.O.A. Turbo Rogue or Ashtech Z12 GPS receivers, and nine sites used choke ring antennas. The WWAVE analysis showed that GPS estimates of zenith wet delay (ZWD) agreed with measurements by the WVR and radiosondes to within 6-12 mm, corresponding to 1-2 mm of PWV. The precision of the GPS measurement of ZWD is better than 6 mm (1 mm of PWV) as shown by the agreement of three closely spaced receivers.

DTIC

Water Vapor; Atmospheric Moisture

19980011681 Science and Technology Corp., Hampton, VA USA

Management Organization for Army Weather Programs and Support Functions Final Report, 12 Dec. 1996 - 12 Dec. 1997

Chesley, Carl H., Science and Technology Corp., USA; Grocki, Vincent P., Science and Technology Corp., USA; Dec. 1997; 107p; In English

Contract(s)/Grant(s): DACA76-93-D

Report No.(s): AD-A332951; STC-TR-3145; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report records the results of the investigators' review of weather support management within the U. S. Army, both recently and briefly over the past 50 years. In its essence, the report, abbreviated at the Army's request, describes a long-term absence of a positive weather culture that has engendered a failure to use weather data and forecasts as helpful information, a force multiplier, a weapon. While STC investigators identified pockets of enthusiasm and evidence of some exciting progress, the overall configuration of Army weather support was peppered with a lack of direction, little soldier involvement, weak planning, and aperiodic cooperation. This report offers a solution within the constraints of today's budgetary and operational limits. It proposes a temporary Senior Leaders Committee to provide immediate leadership and control with initial actions to clarify responsibilities in AR 115-1 OIAFI 15-157. It also proposes the use of TRADOC integrated concept teams to address specific, current issues immediately. Although not requested, the authors also documented observations of specific problems in Army weather support, and where reasonable, offered possible solutions. Additionally, the authors recorded some of the problem commentaries of the Army weather community and their suggested solutions. This report has also been presented in soft copy.

DTIC

Meteorological Parameters; Meteorological Services

48

OCEANOGRAPHY

Includes biological, dynamic, and physical oceanography; and marine resources. For related information see also 43 Earth Resources and Remote Sensing.

19980009253 Woods Hole Oceanographic Inst., Coastal Research Center, MA USA

International Mussel Watch Project. Initial Implementation Phase: Coastal Chemical Contaminant Monitoring Using Bivalves

Farrington, J. W., Woods Hole Oceanographic Inst., USA; Tripp, B. W., Woods Hole Oceanographic Inst., USA; May 1995; 174p; In English

Report No.(s): PB96-186887; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

The objective International Mussel Watch is to assess the extent of chemical contamination in the equatorial and subequatorial areas of the southern hemisphere with particular attention to coastal areas of developing countries. The First Phase took place in South America, Central America, the Caribbean and Mexico with particular emphasis on PCBs and chlorinated pesticides in mollusks collected at 76 sites in 1991 to 1992. Samples from some sites were also analyzed for polycyclic aromatic hydrocarbons. Results show that concentrations of these organic chemicals in mollusks were generally lower than in similar samples collected in the NOAA Mussel Watch Project in the USA. Relatively high levels found in urban areas were within the ranges of concentrations found in the USA. The Project included a chemical intercomparison exercise that involved analytical chemists from the Host Countries.

NTIS

Mollusks; Pesticides; Polycyclic Aromatic Hydrocarbons; Water Pollution; Shellfish; Environment Effects

19980009293 Environmental Protection Agency, Atlantic Ecology Div., Narragansett, RI USA

Environmental Monitoring and Assessment Program (EMAP) Laboratory Methods Manual Estuaries, Volume 1, Biological and Physical Analyses

Strobel, C. J., Editor, Environmental Protection Agency, USA; Klemm, D. J., Editor, Environmental Protection Agency, USA; Lobring, L. B., Editor, Environmental Protection Agency, USA; Eichelberger, J. W., Editor, Environmental Protection Agency, USA; Alford-Stevens, A., Editor, Environmental Protection Agency, USA; Potter, B. B., Editor, Environmental Protection Agency, USA; Thomas, R. F., Editor, Environmental Protection Agency, USA; Lazorchak, J. M., Editor, Environmental Protection Agency, USA; Collins, G. B., Editor, Environmental Protection Agency, USA; Graves, R. L., Editor, Environmental Protection Agency, USA; Aug. 1995; 127p; In English

Report No.(s): PB96-151196; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This document is intended to document analytical methods for use by laboratories conducting analyses for the Environmental Monitoring and Assessment Program-Estuaries. This document is volume 1 of a two-part series. The second volume of the EMAP-Estuaries Laboratory Methods Manual presents methods for the chemical analyses of sediments and tissue.

NTIS

Environmental Monitoring; Chemical Analysis; Estuaries; Manuals

19980009419 Naval Facilities Engineering Service Center, Port Hueneme, CA USA

Sand Wave Study *Final Report*

DeVisser, A., Naval Facilities Engineering Service Center, USA; Sep. 1997; 52p; In English

Report No.(s): AD-A330613; NFESC-TM-2261-OCN; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report will provide further information on the origins of depositional bed forms and their attendant flow regimes. It will focus on sand wave formation, size, and dynamics because the occurrence of these features can have far reaching implications on site selection efforts and the integrity of buried objects such as cables and pipelines.

DTIC

Fluid Dynamics; Pipelines

19980009753 NERAC, Inc., Tolland, CT USA

Oceanic Internal Waves: Studies and Applications. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865167; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning oceanographic data and studies of internal waves, including applications of these studies. The citations reference acoustic scattering by internal waves which affect underwater sound transmission. Underwater objects, stationary and moving alike, are detected by patterns of internal waves that travel from the object to the ocean surface. A few citations reference the use of synthetic aperture radar to detect internal wave influences.

NTIS

Acoustic Scattering; Oceanographic Parameters; Sound Transmission; Synthetic Aperture Radar; Underwater Acoustics

19980009985 Delaware Univ., Center for Applied Coastal Research, Newark, DE USA

Wave Runup and Overtopping on Beaches and Coastal Structures *Topical Report*

Kobayashi, Nobuhisa, Delaware Univ., USA; Sep. 1997; 51p; In English

Contract(s)/Grant(s): DAAL03-92-G-0116

Report No.(s): AD-A332059; CACR-97-09; ARO-30379.56-GS-URI; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Wave runup and overtopping on inclined coastal structures and wave runup on beaches are reviewed together to examine the ranges of wave runup processes occurring on slopes of different inclinations. Laboratory experiments on regular wave runup and overtopping on coastal structures are reviewed first to provide historical perspective. More recent laboratory experiments on irregular wave runup and overtopping on coastal structures are summarized to show the improved quantitative understanding due to the improved capabilities for irregular wave experiments. Field experiments on wave runup on beaches are then reviewed to discuss the possible dominance and causes of low frequency shoreline oscillations on gently sloping beaches. The recent development of time dependent numerical models is reviewed to indicate the rapid progress of the numerical capabilities of predicting irregular wave runup on inclined coastal structures and beaches. This review indicates that the improved quantitative understanding of irregular wave runup and overtopping on inclined coastal structures and irregular wave runup on beaches has essentially been limited to normally incident waves on coastal structures and beaches of alongshore uniformity. Future experimental and numerical studies are suggested in this review.

DTIC

Water Waves; Shorelines; Mathematical Models; Ocean Surface

19980010044 Michigan Univ., Dept. of Atmospheric and Oceanic Science, Ann Arbor, MI USA

Advanced Ocean Surface Measurements with HF Radar *Final Report, 1 Jan. 1994 - 31 Dec. 1995*

Vesecky, John F., Michigan Univ., USA; Feb. 1997; 26p; In English

Contract(s)/Grant(s): N00014-94-I-0371

Report No.(s): AD-A330054; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

HF surface wave radar for ocean wave and current measurements began with collaborative work at Stanford University and Scripps Institution of Oceanography in the late 1960's. Two of the participants in this project (Drs. Teague and Vesecky) have worked with HF radar observations of the ocean since these early experiments. Under this grant a new HF radar design was begun and some prototype construction completed. This work led to construction of a full scale prototype that is now being tested over Monterey Bay, California from a field site kindly provided at the Long Marine Laboratory of the University of California at Santa Cruz. Initial results, including radial current field maps at four frequencies and variations of currents with time, were presented at the American Geophysical Union Fall Meeting in San Francisco, December, 1996. This report contains an overview of the radar

design and its implementation in hardware as well as some preliminary results on vertical shear in the surface current field over Monterey Bay CA.

DTIC

Radar Transmitters; Water Waves; Ocean Surface; Radar Measurement; Product Development

19980010127 Washington State Univ., Pullman, WA USA

Nearshore Wave Processes Final Report

Jan. 1997; 5p; In English

Contract(s)/Grant(s): N00014-94-I-1185

Report No.(s): AD-A332253; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The long term goal of this project was to obtain accurate, detailed predictions of wave properties in the nearshore given the incident wave conditions and local bathymetry, and thus allow for confident simulation of the forcing mechanisms in models that couple wave-driven flows, sediment transport, and changing bathymetry. For the last three years efforts have been focussed on analyzing wave observations made in the Duck94 field experiment and obtaining new observations during the SandyDuck field experiment.

DTIC

Accuracy; Shorelines; Bathymeters; Water Waves

19980010447 Woods Hole Oceanographic Inst., Dept. of Geology and Geophysics, MA USA

High Resolution Measurements of the Shallow Structure of the Oceanic Crust: The Rebuild of NOBEL Final Report, 1 Jan. 1994 - 30 Sep. 1996

Collins, John A., Woods Hole Oceanographic Inst., USA; Oct. 14, 1997; 3p; In English

Contract(s)/Grant(s): N00014-94-I-0293

Report No.(s): AD-A330660; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The goal of this program was to build a deep-towed explosive source that would allow high resolution seismic experiments to be carried out on the ocean floor with a precision and resolving power that is not attainable in any other way. This source, which we call NOBEL (Near Ocean Bottom Explosives Launcher), has an operational depth of 6000 m and can carry, launch and detonate 47 5-10 lb. charges of explosive while being towed a few tens of meters above the ocean floor on a research vessel's conventional 0.68" coaxial cable. Following a completely successful cruise to the East Pacific Rise in early 1991, NOBEL was unfortunately lost in mid-1992 while carrying out a set of experiments over gas hydrate deposits off the East Coast of the U.S. The single objective of this program was to rebuild this unique seismo-acoustic source. Construction of the system is complete. NOBEL was used extensively on an NSF-funded cruise to the Mid-Atlantic Ridge in June of 1997. It was deployed on ten separate occasions and worked superbly each time.

DTIC

Coasts; Ocean Bottom; Resolution; Sound Generators; Depth; Hydrates

19980010808 Naval Research Lab., Coastal and Semi-Enclosed Seas Section, Stennis Space Center, MS USA

Structure of Frequency Domain Models for Random Wave Breaking

Sep. 1996; 14p; In English; 25th; International Conference, 2-6 Sep. 1996, Orlando, FL, USA

Contract(s)/Grant(s): N00014-94-I-0214

Report No.(s): AD-A331899; NRL/PP/7322--96-0036; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We consider the form of a breaking wave dissipation term for use in spectral or stochastic wave evolution models. A time domain Boussinesq model is tested for accuracy in modeling evolution of second and third moment statistics in shoaling and breaking waves. The structure of the dissipation term in the time domain is then used to infer the corresponding structure of the term in the frequency domain. In general, we find that the dissipation coefficient is distributed like $1/S(\eta)(f)$, where $S(\eta)(f)$ is the spectral density of the surface displacement η . This implies an f^2 dependence for the coefficient in the inner surfzone, as opposed to a constant distribution over frequency as suggested by Eldeberky and Battjes (1996).

DTIC

Ocean Models; Coasts; Domains; Environmental Engineering; Wave Scattering; Breaking

19980010809 Naval Postgraduate School, Monterey, CA USA

Lagrangian Measurements of Eddy Characteristics in the California Current System

Sires, James G., Naval Postgraduate School, USA; Mar. 1997; 134p; In English

Report No.(s): AD-A331919; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

During the Eastern Boundary Current program in 1993, 96 ARGOS-tracked surface drifters, drogued to 15 m depth, and satellite thermal imagery were used to provide a description of the mesoscale features in the California Current System off the northern California coast. The drifter movements and satellite images revealed a highly energetic series of filaments and eddies that dominated the summer flow field off the coast, similar to those noted in the earlier CODE, OPTOMA, and CTZ studies. Winter mesoscale activity in the region was less energetic, with the principle feature being the poleward-flowing Davidson Current. Translation rates for mesoscale eddies were deduced from drifter trajectories in the summer period. Translation rates, vorticity, divergence and eddy center positions were also estimated for a cyclone and anticyclone sampled in July and September, respectively, by constraining observed drifter velocities to a linear Taylor expansion in the least square sense. Translation rates from this technique were similar to those observed from previous shipboard surveys and drifter motions. Using observations over 7 (12) days, the cyclonic (anticyclonic) eddy was determined to have a translation rate of 3.7 (4.2) cm/s to the southwest. The least square technique, applied to shorter time periods, however, provided unreliable estimates of eddy properties when drifters were not evenly distributed around the eddy.

DTIC

Ocean Currents; California; Flow Distribution; Mesoscale Phenomena; Satellite Imagery; Cyclones; Anticyclones; Satellite Tracking

19980010819 Monterey Bay Aquarium Research Inst., Moss Landing, CA USA

Circulation within Monterey Submarine Canyon Final Report, 1 Mar. 1993 - 28 Feb. 1996

Rosenfeld, Leslie, Monterey Bay Aquarium Research Inst., USA; Nov. 1997; 7p; In English

Contract(s)/Grant(s): N00014-93-I-0403

Report No.(s): AD-A331875; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project studied the circulation and transport of material in Monterey Submarine Canyon. Five subsurface moorings supporting twelve current meters with temperature sensors (six also measured conductivity and light transmission) and six sediment traps were deployed. Numerous CTD casts were made during four cruises. As expected, tidal frequencies dominated the energy spectra, and mean currents were very weak. Surprisingly, a three-day oscillation was found at all the measurement sites within the canyon. Two sediment traps deployed in the narrower region of the canyon recorded dramatically different flux regimes, with the 780 m trap collecting 2-4 g/sq m d, and the 1360 m trap collecting 22-60 g/sq m d. The predominantly lithogenic composition of the material in the deeper trap is evidence that canyon wall resuspension events dominate the flux regime there, whereas the lower concentrations of lithogenic material in the shallower trap, together with the seasonal pattern in the opal flux, indicate the influence of seasonal phytoplankton blooms. The mass fluxes measured in the wider part of the canyon were only 0.2-1.7 g/sq m d.

DTIC

Ocean Currents; Sediment Transport; Canyons

19980010891 Delaware Univ., Center for Applied Coastal Research, Newark, DE USA

Quasi 3-D Modeling of Nearshore Hydrodynamics

van Dongeren, A. R., Delaware Univ., USA; Svendsen, Ib A., Delaware Univ., USA; Aug. 1997; 262p; In English

Contract(s)/Grant(s): DAAL03-92-G-0116

Report No.(s): AD-A332149; CACR-97-04; ARO-30379.57-G5-URI; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

In this thesis a depth integrated, shortwave averaged nearshore circulation model, called SHORECIRC, is developed, which includes the current current and current wave interactions over depth. This model belongs to the class of quasi 3D models, which combine the effect of the vertical structure with the simplicity of 2DH models. The present model uses semi-analytical solutions for the 3D current profiles in combination with a numerical solution of the depth integrated 2D horizontal equations. The goal of this model is to gain an enhanced prediction and analysis capability for nearshore circulation on any bathymetry and under any hydrodynamical condition. The current current, current wave induced dispersion mechanism has previously been found to significantly augment the lateral turbulent mixing in the case of a steady, uniform longshore current on a straight coast. In this thesis, the generalized quasi 3-D continuity and momentum equations governing nearshore circulation are presented. These equations are based on the complete Reynolds equations with as few additional assumptions as possible.

DTIC

Ocean Models; Applications Programs (Computers); Coastal Currents; Three Dimensional Models

19980010929 Woods Hole Oceanographic Inst., MA USA

Coastal Mixing and Optics Experiment; Mooring Deployment Cruise Report R/V Oceanus Cruise Number 284, 31 July-11 August 1996

Galbraith, Nancy, Woods Hole Oceanographic Inst., USA; Ostrum, William, Woods Hole Oceanographic Inst., USA; Way, Brian, Woods Hole Oceanographic Inst., USA; Lentz, Steve, Woods Hole Oceanographic Inst., USA; Anderson, Steve, Woods Hole Oceanographic Inst., USA; Baumgartner, Mark, Woods Hole Oceanographic Inst., USA; Plueddeman, Al, Woods Hole Oceanographic Inst., USA; Aug. 1997; 89p; In English

Contract(s)/Grant(s): N00014-95-1-0339

Report No.(s): AD-A331699; WHOI-97-13; UOP-TR-97-02; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

An array of moorings at four sites at a mid-shelf location in the mid-atlantic Bight was deployed for a period of 10 months beginning in August 1996 as part of the Coastal Mixing and Optics Experiment (CMO), funded by the Office of Naval Research (ONR). The purpose of this array is to gather information to help identify and understand the vertical mixing processes influencing the evolution of the stratification over the shelf. The observations from this moored array will be used to investigate changes in the stratification in response to atmospheric forcing, surface gravity wave variability, surface and bottom boundary layer mixing, current shear, internal waves, and advection. This report describes the primary mooring deployments carried out by the Upper Ocean Processes (UOP) Group on the R/V Oceanus, sailing out of Woods Hole during July, August, and September of 1996.

DTIC

Mooring; Stratification; Bays (Topographic Features); Surface Waves; Coasts; Oceans

19980010960 Naval Research Lab., Coupled Dynamic Processes Section, Stennis Space Center, MS USA

Diffuse Reflectance of the Optically Deep Sea under Combined Illumination of its Surface

Haltrin, Vladimir I., Naval Research Lab., USA; Aug. 1997; 5p; In English

Report No.(s): AD-A331367; NRL/PP/7331--97-0029; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The processing of remotely measured color imagery involves knowledge of the diffuse reflectance of the oceanic water. This paper presents two approaches to this problem. The first one is analytical and consists of an approximate solution to the radiative transfer equation. As a result it gives an equation for diffuse reflectance of the sea as a function of inherent optical properties, the sun elevation angle and the ratio of the direct illumination by sun to the diffuse illumination by sky. The second approach is a numerical Monte Carlo simulation. The results of this simulation are processed to produce regressions that connect diffuse reflectance of the seawater for different hydrooptical situations to the sun elevation angle.

DTIC

Ocean Bottom; Optical Properties; Radiative Transfer; Reflection; Sea Water; Seas; Simulation; Water

19980010961 Naval Research Lab., Coupled Dynamic Processes Section, Stennis Space Center, MS USA

Light Scattering Coefficient of Seawater for Arbitrary Concentrations of Hydrosols

Haltrin, Vladimir J., Naval Research Lab., USA; Aug. 1997; 5p; In English

Report No.(s): AD-A331368; NRL/PP/7331--97-0012; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The scattering coefficient of seawater as a function of concentration of hydrosol particles is calculated. The approach used is based on the Maxwell's equations in a stochastically scattering seawater. The water is modeled as thermally fluctuated medium filled with the hydrosol particles. It is found that the scattering coefficient quadratically depends on concentration when the concentration of scatterers is very small. The scattering coefficient is linear to concentration of scatterers at values typical to the open ocean. At the values of concentrations typical to coastal waters the dependence on concentration weakens and reaches the saturation at very high values.

DTIC

Oceans; Scattering; Scattering Coefficients; Sea Water; Stochastic Processes

19980010962 Naval Research Lab., Coupled Dynamic Processes Section, Stennis Space Center, MS USA

Retrieval of Remote Radiance Reflection Coefficients of Coastal Waters from the Inherent Optical Properties

Haltrin, Vladimir I., Naval Research Lab., USA; Aug. 1997; 5p; In English

Report No.(s): AD-A331369; NRL/PP/7731--97-0010; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Upwelling spectral radiances from the water surface and in situ inherent optical properties are measured concurrently at the same locations. Values of spectral radiance reflectance coefficients are derived from in situ data and compared with those obtained from spectral radiance data. An algorithm for estimating reflectance coefficients based on attenuation and absorption data is proposed and evaluated. This algorithm is based on the theoretically derived equations and the experimentally obtained regressions that connect scattering and backscattering coefficients. Overall comparison of derived and measured radiance coefficients shows

that this algorithm is suitable for processing ground truth data for the purposes of calibration remote and in situ optical measurements.

DTIC

Algorithms; Backscattering; Calibrating; Coastal Water; Coefficients; Emission Spectra; Estimating; Radiance; Reflectance; Scattering Coefficients

19980010980 University of Southern California, Dept. of Aerospace Engineering, Los Angeles, CA USA

Experimental and Theoretical Analysis of Small-Scale Wind-Wave Generation *Final Report, 1 Apr. 1992 - 31 Mar. 1997*

Spedding, Geoff, University of Southern California, USA; Newton, Paul, University of Southern California, USA; Browand, Frederick, University of Southern California, USA; Aug. 04, 1997; 44p; In English

Contract(s)/Grant(s): N00014-92-J-1615

Report No.(s): AD-A331970; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This research project was initiated to explore the use of novel analysis techniques associated with emerging nonlinear methods to investigate the growth of capillary-gravity waves on an initially calm water surface following the abrupt start of wind forcing. During the course of the research, a novel wavelet-based method was devised and implemented for computing the local, instantaneous dispersion relation. The method is completely quantitative, and conserves energy. While averaged results showed exponential growth rates that agree approximately with linear theory, it is clear that details of the wave crest distribution that are important in determining subsequent nonlinear developments cannot be captured without not only a nonlinear theory, but also a 2D one. The most useful experiment to follow up this work would not be the obvious increase in scale, but would rather concentrate on a smaller scale facility where the 2D wind profile could be very closely controlled, and measured. Only then can the forcing effects be unambiguously separated from 2D nonlinear growth mechanisms.

DTIC

Water Waves; Capillary Waves; Mathematical Models; Data Acquisition; Wave Generation; Dispersions

19980011544 Scripps Institution of Oceanography, San Diego, CA USA

Deployment of Towed Gravity Meter *Final Report, 1 Oct. 1992 - 30 Sep. 1997*

Ridgway, Jeff, Scripps Institution of Oceanography, USA; Zumberge, Mark, Scripps Institution of Oceanography, USA; Hildebrand, John, Scripps Institution of Oceanography, USA; Nov. 25, 1997; 4p; In English

Contract(s)/Grant(s): N00014-93-1-0012

Report No.(s): AD-A332774; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Gravity can be measured on the sea surface and on the seafloor. Surface gravity suffers from lack of resolution over deep seas, because the perturbing source masses are far from the meter. Bottom measurements recover this resolution, but suffer from poor coverage because of the time needed for individual measurements. Our proposed solution to this problem is a towed deep-ocean gravity meter (TOWDOG), which combines the rapid data collection of shipboard measurements with resolution approaching ocean bottom measurements. The near-bottom gravity measurements have the advantages of both existing techniques while avoiding the problems inherent in each one. While gravity methods have been used on land for several decades to further our understanding of earth structure, we are just beginning to bring the power of gravity field quantification to constructing detailed models of the crust underlying the ocean. Our work focuses on the development of gravity measuring and interpretation tools that can be applied to undersea structures such as seafloor volcanoes and mid-ocean ridges. Rather than relying on the standard marine gravimetric methods, we wish to lengthen the list of tools available to the marine geophysicist for applying gravity measurements to understanding the makeup of the crust beneath the oceans. Gravity can be measured on the sea surface and on the seafloor. Surface gravity suffers from lack of resolution over deep seas, because the perturbing source masses are far from the meter. Bottom measurements recover this resolution, but suffer from poor coverage because of the time needed for individual measurements. Our proposed solution to this problem is a towed deep-ocean gravity meter (TOWDOG), which combines the rapid data collection of shipboard measurements with resolution approaching ocean bottom measurements.

DTIC

Gravimetry; Ocean Surface; Ocean Bottom; Crusts; Mid-Ocean Ridges; Geophysics

19980011546 Johns Hopkins Univ., Applied Physics Lab., Laurel, MD USA

Physical and Biological Descriptors for Ocean Bubbles and Acoustic Surface Backscatter *Final Report, 1 Oct. 1994 - 30 Sep. 1997*

Hanson, Jeffrey L., Johns Hopkins Univ., USA; Sep. 30, 1997; 37p; In English

Contract(s)/Grant(s): N00014-97-1-0078; N00014-97-1-0075

Report No.(s): AD-A332748; STD-R-2694; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Processes related to the supply, mixing, and removal of ocean bubbles and their impact on low frequency (0-1000 Hz) acoustic surface scattering strength (SSS) in the upper ocean have been investigated. A key finding is that gross site-to-site differences between Critical Sea Test and Chapman-Harris SSS observations are explained by the mean ocean temperature, biological productivity, and wave conditions at each site. Furthermore, wave energy dissipation rate, estimated from wave spectra using wave energy flux considerations, was found to be a better descriptor for ocean whitecaps, related to upper ocean bubble supply, than wind speed. These results demonstrate that a model could be developed for estimating SSS statistics in coastal areas using readily available (by satellite and operational models) environmental inputs.

DTIC

Ocean Surface; Acoustic Scattering; Energy Dissipation; Bubbles; Low Frequencies; Ocean Temperature; Coasts

19980011571 Naval Facilities Engineering Service Center, Port Hueneme, CA USA

Analysis of Ocean Wave Fields Using the Harmonic Phase Tracking Parameter Estimation Technique *Final Report, 1 Oct. 1992 - 15 Jun. 1997*

Palo, P. A., Naval Facilities Engineering Service Center, USA; Sep. 1997; 427p; In English

Report No.(s): AD-A330699; NFESC-TR-2083-OCN; No Copyright; Avail: CASI; A19, Hardcopy; A04, Microfiche

A uniquely new time series analysis technique called 'Harmonic Phase Tracking' (HPT) was developed and used to examine the spatial and temporal evolutionary characteristics of a hurricane wave field. The fundamental motivation was to investigate whether ocean waves were random, or if they instead self-organize into a finite number of locally stationary discrete sinusoids. Instead of the uniformly-spaced set of component frequencies inherent with the commonly-used Fourier Series (FFT) representation of a time series signal, HPT estimates the true number of harmonics along with the true frequencies, amplitudes and phases. HPT can be applied to wideband signals, and the parameters can be slowly-varying. Deterministic versus stochastic components are also readily identified. This new HPT-based representation has great promise for the better understanding of ocean waves. Two sets of ocean waves were analyzed: a control group that corresponds to stationary conditions, and a second set that corresponds to Hurricane Bob. The analysis clearly showed that there is in fact a coherent and discrete structure to the energy content in the wave field; that is, waves do 'self organize' into recognizable wave packets, with parameters that evolve very slowly over space and time.

DTIC

Ocean Surface; Wave Packets; Water Waves; Stochastic Processes; Estimating; Ocean Dynamics

19980011597 National Oceanic and Atmospheric Administration, Monterey Bay National Marine Sanctuary, Monterey, CA USA

Comparison of Drifting Buoy and HF Radar (CODAR) Ocean Surface Currents in Monterey Bay, California *Final Report, Aug. 1992 - Oct. 1994*

Paduan, J. D., National Oceanic and Atmospheric Administration, USA; Pickett, M. H., National Oceanic and Atmospheric Administration, USA; Cook, M. S., National Oceanic and Atmospheric Administration, USA; Apr. 12, 1996; 40p; In English
Report No.(s): PB96-163571; NOAA/NOS/OCRM-MBNMS-96/01; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

This report includes further background information on the method of measuring surface currents using HF radar and an overview of Monterey Bay Surface currents. Sections 2 and 3 describe the drifter deployments conducted in August 1992 and October 1994 and the statistical comparison of drifter and radar-derived surface currents, respectively. The complete data set of drifter-derived current vectors are presented on maps of the radar-derived current fields in the Appendix.

NTIS

Ocean Currents; Buoys; Radar; Ocean Surface; Technologies; High Frequencies; Surface Energy

19980011678 Naval Research Lab., Arlington, VA USA

Validation Test Report for the Coastal Wave Refraction and Diffraction Model *Final Report*

Hsu, Y. L., Naval Research Lab., USA; Macnaughton, Andrew, Naval Research Lab., USA; Nov. 24, 1997; 27p; In English
Contract(s)/Grant(s): 0603207N; Proj. X2008

Report No.(s): AD-A332946; NRL/FR/7322--97-9664; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In coastal water, wave propagation is affected by many dynamic processes, including shoaling, refraction, diffraction, and energy dissipation. The existing RCPWAVE wave model in the Navy-Standard surf model was developed for open coast with slowly varying bathymetry. It cannot handle certain coastline configurations such as those that include islands and peninsulas. It also has a serious numerical instability problem. The more recently developed REF/DIFi wave model has a more robust formulation and does not suffer from the same limitations. In this report, a systematic set of tests was conducted to evaluate the REF/DIFi. The tests evaluate the shoaling and refraction, combined refraction and diffraction, energy dissipation, and wave-current interac-

tion properties of the model. The model results were compared to analytic solutions from linear wave theory, laboratory and field data. REF/DIFi was found to perform adequately in all tests. The REF/DIFi has been integrated into the Navy-Standard surf model. DTIC

Analysis (Mathematics); Bathymeters; Energy Dissipation; Mathematical Models; Peninsulas; Refraction; Water Waves; Wave Propagation

19980011698 Naval Research Lab., Stennis Space Center, MS USA

Review and Verification of Numerical Wave Models for Near Coastal Areas, Part 1, Review of Mild Slope Equation, Relevant Approximations, and Technical Details of Numerical Wave Models *Final Report*

Kaihatu, James M., Naval Research Lab., USA; Nov. 07, 1997; 31p; In English

Report No.(s): AD-A332753; NRL/FR/7322--97-9669; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Ocean wave propagation is heavily affected by bathymetric variation, particularly in the nearshore areas. In this report, the theoretical basis behind the mild slope equation, which is often used for modeling wave propagation, is discussed. In particular, the theory and technical details of the models REF/DIF1, REF/DIF-S, and RCPWAVE are defined. (REF/DIF-S is an irregular wave version of REF/DIF1.) Two different modifications of the mild slope equation that simplify the modeling of wave propagation for general areas: the parabolic approximation, which is used in the model REF/DIF1 and REF/DIF-S; and the eikonal-transport equations, used in RCPWAVE are examined. The consequences of using either modification is also discussed. Incorporation of relevant physical effects (e.g., wave breaking, bottom friction, etc.) that affect wave propagation in the nearshore area is illustrated.

DTIC

Bathymeters; Mathematical Models; Ocean Surface; Water Waves; Friction; Coasts

19980011871 Woods Hole Oceanographic Inst., MA USA

Boundary Conditions and Sound Scattering Models for Various Zooplankton

Stanton, Timothy K., Woods Hole Oceanographic Inst., USA; Chu, Dezhang, Woods Hole Oceanographic Inst., USA; Wiebe, Peter, Woods Hole Oceanographic Inst., USA; Jun. 1994; 5p; In English

Contract(s)/Grant(s): N00014-89-J-1729; NSF OCE-92-01264

Report No.(s): AD-A329874; WHOI-Contrib-8655; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Echosounders are widely used in the remote detection and classification of marine organisms such as zooplankton. In order to interpret the data, accurate acoustic scattering models must be used. Zooplankton present a formidable challenge when attempting to describe their scattering properties. These animals come in many sizes, shapes, and material properties. The animals can be divided into several major categories of gross anatomical groupings; fluid like or weak scatterers, bodies with gas inclusions, and fluid filled elastic shelled bodies. Approximate models according to the different shapes and boundary conditions have been developed for these anatomical types.

DTIC

Acoustic Scattering; Underwater Acoustics; Boundary Conditions; Scattering; Sound Propagation; Models; Zooplankton

51

LIFE SCIENCES (GENERAL)

19980009531 Oregon State Univ., Dept. of Botany and Plant Pathology, Corvallis, OR USA

Mechanisms of Viral Infection in Marine Brown Algae *Final Report, 1 Jan. - 31 Dec. 1996*

Meints, Russel H., Oregon State Univ., USA; Oct. 1997; 4p; In English

Contract(s)/Grant(s): N00014-93-I-0251

Report No.(s): AD-A330610; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Eukaryotic marine algal viruses are large, dsDNA viruses. Feldmannia species Virus (resolved in two genome size classes 158 and 178 kbp) was developed as our prototype study systems. This virus infects marine brown algae. In nature sporophytic plants develop both plurilocular (mitotic) sporangia producing 2N spores and unilocular (meiotic) sporangia producing N spores. 2N spores normally yield adult sporophytes; haploid spores produce male and female gametophytes whose spores are the gametes for the sexual cycle. In the virus infected plant this life cycle is altered. Sporangia from virus-infected sporophytes do not produce spores. Instead unilocular sporangia contain virus particles. We show that the virus genomes exists in an integrated form within all other cells. All together the data suggest an integration/excision mechanism that employs an integrase/recombinase and conser-

vative site-specific recombination. This enzyme complex appears to include topoisomerase-like activities which recognize sites within the virus and host. Unlike previously described systems we expect blunt end cutting and ligation or single bp. A large family of 173 bp repeat elements in the FsV genome was characterized. Two ORFs for 'RING' zinc finger bearing genes were found as were two protein kinase genes. Northern blots demonstrated 6 major and 18 minor transcripts. The most abundant transcript was the major structural protein. Sequence analysis indicated significant homology with proteins of Chlorella-virus, Iridioviruses and African Swine Virus.

DTIC

Africa; Algae; Chlorella; Cutting; Viral Diseases; Spores; Swine; Viruses

19980009763 Georgetown Univ., School of Medicine, Washington, DC USA

The Role of Interferon in the Cellular Response of the CNS Macrophage, the Microglia, During Injury and Inflammation
Final Report, 1 Nov. 1993 - 31 Oct. 1996

Colton, Carol A., Georgetown Univ., USA; Oct. 09, 1997; 6p; In English

Contract(s)/Grant(s): N00014-91-J-1123

Report No.(s): AD-A332085; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our lab has studied the response of the CNS macrophage, the microglia to injury and inflammation. Using an in vitro approach, we have shown that microglia cultured from the cerebral cortices of neonatal animals (rat, mouse, hamster or human) have the same functional responses as non-CNS macrophages. That is, they demonstrate chemotaxis, express macrophage-like surface antigens and they produce a variety of cytoactive factors including proteases, interleukin-1 and reactive oxygen species (superoxide anion and nitric oxide). We found that both inflammatory and immune mediators (lipopolysaccharide and interferons, respectively) enhance the production of superoxide anion but do not directly activate the NADPH oxidase. These agents also increase Nitric Oxide (NO) production but in a very different time frame than that found for superoxide anion. Treatment of microglia with isopretrenol or dexamethazone depressed the microglial production of ROS. Our studies also demonstrated that human and hamster microglia do not produce NO in response to the same stimulating factors used in rat or mouse microglia. Hamster and human microglia did not produce NO except when treated with the double stranded polyribonucleotide, poly inosinic acid: poly cytidylic acid (Poly I:C). These findings have important consequences to the understanding of the response of humans to inflammation or injury.

DTIC

Injuries; Interferon; Cells (Biology); Wound Healing; Macrophages

19980009820 Stanford Univ., Dept. of Biological Sciences, Stanford, CA USA

Cellular Interactions in the Suprachiasmatic Nucleus *Final Report, 1 May 1993 - 30 Apr. 1997*

vandenPol, Anthony, Stanford Univ., USA; Apr. 30, 1997; 6p; In English

Contract(s)/Grant(s): F49620-93-I-0283; AF Proj. 2312

Report No.(s): AD-A330024; AFOSR-TR-97-0510; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the period (1993-1997) of support from AFOSR, we completed many papers. Some of those listed below deal exclusively with the subject of the proposal, the suprachiasmatic nucleus, and some deal indirectly with issues related to the circadian clock or transmitters found in the SCN. A substantial effort was invested in examining the two primary transmitters in the SCN, glutamate, which is excitatory, and GABA, which is inhibitory. These two are particularly important because the primary input from the retina that phase-shifts the clock is glutamate, and the primary transmitter made by SCN cells themselves is GABA.

DTIC

Circadian Rhythms; Glutamic Acid

19980009946 Portland State Univ., OR USA

Rapid Toxicity Assessment Using Micro-Eukaryotes *Final Report, 1 Sep. 1995 - 30 Nov. 1996*

Pratt, James R., Portland State Univ., USA; Dec. 1996; 78p; In English

Contract(s)/Grant(s): DAMD17-95-I-5067

Report No.(s): AD-A332242; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This research evaluated growth of the soil ciliate *Colpoda inflata* (Stokes) in rapid toxicity tests by determining sensitivity to model compounds and differences in bioavailability of toxicants in different test media. Additional studies examined the bioassay in a field situation and examined another sublethal indicator (feeding rate) in rapid toxicity tests. Related studies evaluated rapid growth tests using the alga *Haematococcus lacustris* using methods similar to those used in the ciliate bioassay. *C. inflata* was more sensitive to toxicants in an inorganic medium than in media with high organic carbon content. *C. inflata* growth was more sensitive overall than other rapid-screening tests and many standard acute toxicity tests. Field tests showed that the rapid

test could be applied to complex mixtures in the field. Feeding rate of *C. inflata* was significantly reduced by copper at levels comparable to the IG50 for ciliate growth. Rapid-screening tests of *H. lacustris* showed less sensitivity than the ciliate bioassays. When ranked with other bioassays, *H. lacustris* was the third most tolerant. Microeukaryotes that produce dormant life-stages such as cysts are ideal for use in rapid-screening bioassays. The organisms can be stored dormant, grown on demand, and be used in a 'battery of tests' applied to site and contaminant screening.

DTIC

SOILs; Sensitivity; Vitreous Materials; Toxicity; Bacteria

19980010001 Army Cold Regions Research and Engineering Lab., Hanover, NH USA

The Effects of Temperature on Germination of Eleven Festuca Cultivars

Palazzo, Antonio J., Army Cold Regions Research and Engineering Lab., USA; Brar, Gurdarshan S., Army Cold Regions Research and Engineering Lab., USA; Aug. 1997; 11p; In English

Report No.(s): AD-A330578; CRREL-SR-97-19; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Many studies have shown that water potential at planting affects the germination rate and final germination of *Festuca* cultivars. Limited information is available about the extent of variability in temperature-dependence of germination among different *Festuca* cultivars. Our objective was to study germination at five temperatures for a wide range of *Festuca* cultivars. *Festuca* seeds were screened for germination during 28 days in polyethylene growth pouches held at constant temperatures of 10, 15, 20, 25, or 300 C. The germination percentage significantly (p less than 0.05) increased as the temperature increased from 10 to 150 C, when averaged across the cultivars, and decreased thereafter. The cultivar 'Clemfine' tall fescue (*Festuca arundinaceae* Schreb.) had the greatest germination percentage, and 'Arctared' red fescue (*Festuca rubra* L.) had the least when averaged across the five temperatures. Conversely, the Average Time to Germination (ATG) was greatest at 100 C and least at 300 C. Reaching a germination level of 80% or more of the seeds required 14 days at 100 C, 9 d at 150 C, 8 d at 200 C, and 7 d at 25 or 300 C. Base temperatures required for germination of *Festuca* species were 3.20 C for rapid germinators, 3.6 to 60 C for medium germinators, and 4 to 60 C for poor germinators. Heat units (growing degree-days greater than 100 C) calculated for the rapid germinators were 1290 C-d, 120 to 1400 C-d for medium germinators, and 135 to 1910 C-d for the poor germinators. Germination decreased as heat units were increased. The ATG and heat unit regressions explained.

DTIC

Temperature Effects; Germination; Farm Crops; Temperature Dependence

19980010432 Rochester Univ., Dept. of Environmental Medicine, NY USA

Developmental Neurotoxicity of Methanol Exposure by Inhalation in Rats *Topical Report, Jun. 1990 - Jun. 1994*

Weiss, B., Rochester Univ., USA; Stern, S., Rochester Univ., USA; Soderholm, S. C., Rutgers Univ., USA; Cox, C., Rutgers Univ., USA; Sharma, A., Rochester Univ., USA; Apr. 1996; 78p; In English

Report No.(s): PB96-189873; HEI-RR-96/73; Copyright Waived; Avail: CASI; A05, Hardcopy; A01, Microfiche

The possibility of widespread methanol exposure via inhalation stemming from its adoption as an automotive fuel or fuel component arouses concern about the potential vulnerability of the fetal brain. This project was designed to help address such concerns by studying the behavior of neonate and adult Long-Evans hooded rats following perinatal exposure to methanol vapor at 4,500 ppm for six hours daily beginning on gestation day 6 with both dams and pups then being exposed through postnatal day (PND) 21. Blood methanol concentrations of the dams, measured immediately following a six-hour exposure, were approximately 500 to 800 micrograms/milliliter. Average blood methanol concentrations in the pups were about twice those of the dams. Neurotoxicity was assessed by behavioral tests used previously to reveal adverse effects following developmental exposures to ethanol, cocaine, heavy metals, and other agents. Exposure of neonates to methanol did not affect suckling latency and attachment on PND 5, or performance on the conditioned olfactory aversion test on PND 10. Exposure to methanol did alter performances in the motor activity tests. Methanol-exposed neonates were less active on PND 18, but more active on PND 25 than the equivalent control-group pups. Schedule-controlled running in adults displayed a complex interaction with treatment. Changes in performance over the course of training differed between males and females depending on exposure to methanol. The results of the complex stochastic reinforcement schedule revealed behavioral differences due to methanol exposure in adults that were relatively subtle in nature and appeared after a new pattern of contingencies was introduced.

NTIS

Automobile Fuels; Toxicity; Air Pollution; Physiological Effects; Methyl Alcohol

19980010450 Colorado State Univ., Dept. of Anatomy and Neurobiology, Fort Collins, CO USA

Cellular Neurophysiology of the Rat Suprachiasmatic Nucleus: Electrical Properties, Neurotransmission, and Mechanisms of Synchronization Final Report, 1 Jul. 1993 - 30 Jun. 1997

Dudek, F. E., Colorado State Univ., USA; Jun. 1997; 12p; In English

Contract(s)/Grant(s): F49620-93-I-0302; AF Proj. 2312

Report No.(s): AD-A329946; AFOSR-97-0464TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Early experiments included sharp-intracellular-electrode analyses of amino-acid-mediated synaptic transmission and intrinsic membrane properties, designed in part to reveal the degree to which SCN neurons are homogenous or heterogenous. This work showed that glutamate and GABA play critical roles in synaptic transmission in the SCN, and that SCN neurons are not homogenous in terms of their electrophysiological properties, although they could not be grouped into distinct neuron classes. Multiple-unit extracellular recordings showed synchronous bursts of action potentials in the SCN in low Ca²⁺(+) solutions containing amino-acid-receptor antagonists (demonstrated to block chemical synapses), thus suggesting that SCN neurons are capable of communicating through nonsynaptic mechanisms. Whole-cell patch-clamp data showed that SCN neurons have a novel delayed outward-rectifier K⁺ current and a transient K⁺ current (i.e., A-current), both of which are present in all SCN neurons. More recently, we have studied local synaptic circuits and GABA-mediated inhibition in the SCN. Using glutamate microapplication to selectively stimulate only SCN neurons, we have provided physiological evidence that SCN neurons are interconnected by inhibitory circuits.

DTIC

Amino Acids; Neurophysiology; Rats; Experimentation; Cells (Biology); Nervous System

19980010577 General Accounting Office, Washington, DC USA

Report to Congressional Committees. US Department of Agriculture: Information on the Condition of the National Plant Germplasm System

Oct. 1997; 92p; In English

Report No.(s): AD-A330524; GAO/RCED-98-20; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

NPGS is primarily a federally and state-supported effort aimed at maintaining supplies of plant germplasm with diverse genetic traits for use in breeding and scientific research. The diversity in germplasm collections enables breeders to develop improved crops that are more productive and often less vulnerable to pests and diseases. These collections are particularly important because the diversity of germplasm worldwide has been reduced by several factors, such as the widespread use of genetically uniform crops in commercial agriculture and the destruction of natural habitats that have been important sources of germplasm. The Agricultural Marketing Act of 1946 established the main components of NPGS as well as a legal basis for federal and state cooperation in managing plant genetic resources. NPGS' current organizational structure-a geographically dispersed network of germplasm collections administered primarily by USDA'S Agricultural Research Service (ARS)-merged in the early 1970s. NPGS maintains about 440,000 germplasm samples for over 85 crops at 22 sites throughout the country and in Puerto Rico; almost half of these samples are maintained at four regional plant introduction stations. Germplasm samples are held in crop collections, each of which generally includes four types of germplasm (for example, germplasm from cultivated plants and germplasm from wild relatives of cultivated plants). Each type of germplasm contains genetic material that plays an important role in the collections' overall diversity.

DTIC

Agriculture; Breeding (Reproduction); Farm Crops; Genetics; Habitats

19980010580 National Inst. of Environmental Health Sciences, Research Triangle Park, NC USA

Toxicology and Carcinogenesis Studies of 1,2-Dihydro-2, 2,4-Trimethylquinoline (CAS No. 147-47-7) in F344/N Rats and B6C3F1 Mice (Dermal Studies) and the Initiation/Promotion (Dermal Study) in Female SENCAR Mice

Feb. 1997; 315p; In English

Report No.(s): PB98-101009; NTP-TR-456; NIH/PUB-97-3372; No Copyright; Avail: CASI; A14, Hardcopy; A03, Microfiche

A 1,2-Dihydro-2, 2,4-trimethylquinoline (monomer) is used as antioxidant instyrene-butadiene and nitrile-butadiene rubbers and latexes. It was nominated by the National Cancer Institute as part of a review of chemicals used in the manufacture and processing of rubber, during which potential occupational and consumer exposure to this compound can occur. It was selected for evaluation because it is a derivative of quinoline, a known rodent carcinogen, and was regarded as having potential carcinogenic activity. Because of the pattern of use and exposure, dermal administration was considered most appropriate.

NTIS

Toxicity; Monomers; Quinoline; Antioxidants; Carcinogens; Occupational Diseases; Rubber; Latex

19980010582 California Univ., San Diego, La Jolla, CA USA

Cholinesterase Structure: Identification of Residues and Domains Affecting Organophosphate Inhibition and Catalysis
Annual Report, 6 Mar. 1996 - 5 Mar 1997

Taylor, Palmer W., California Univ., San Diego, USA; Apr. 1997; 80p; In English

Contract(s)/Grant(s): DAMD17-95-1-5027

Report No.(s): AD-A329999; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In the second year of the grant, we have made excellent progress in several arenas: (1) The crystal structure of a mouse acetylcholinesterase-fasciculin 2 complex has provided an essential template for structure-function studies; (2) Studies with a series of enantiomeric organophosphates have been completed; they have yielded vital information on their binding orientation in the ground and transition states. Residues governing enantiomer specificity and leaving group orientation have been defined; (3) Studies in oxime reactivation of cholinesterase inhibited by the enantiomeric phosphates show two faces of attack between the oxime and the conjugated phosphonate; (4) The interactions of fasciculin 2 with acetylcholinesterase have been studied by kinetic and site-specific mutagenesis methods. The fasciculin2-acetylcholinesterase complex has enabled us to study entry of ligands to the active center gorge.

DTIC

Acetyl Compounds; Cholinesterase; Crystal Structure; Organic Phosphorus Compounds; Phosphates; Catalysis

19980010606 Boston Univ., Boston, MA USA

Antifreeze Polypeptides as Biomineralization Models *Final Report, 15 Aug. 1994 - 14 Aug. 1997*

Laursen, Richard A., Boston Univ., USA; Oct. 25, 1997; 6p; In English

Contract(s)/Grant(s): DAAH04-94-G-0308

Report No.(s): AD-A332083; ARO-32.914.6-LS; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the past three years we have focused on three specific aims: (1) understanding the mechanism of ice-binding by antifreeze polypeptides (AFPs), (2) synthesis and characterization of peptides (CBPs) that alter the morphology of a mineral, calcite, and (3) characterizing the interaction between a specific CBP and calcite. In the course of pursuing aim (1), we discovered, in the longhorn sculpin, a new class (type W) of antifreeze protein and have determined completely both its protein and DNA sequences. It contains 108 amino acids and, we believe, based on secondary structure analysis, folds into a 4-helix bundle. We have designed and synthesized an alpha-helical peptide designed 'de novo' to bind to the prism face of calcite. This peptide has a remarkable effect on calcite crystal morphology: at low temperatures, in its helical form, it does appear to bind to a prism face, but when the peptide is unfolded, it causes epitaxial growth off the rhombohedral surfaces of calcite seed crystals, resulting in very unusual morphology. This is perhaps the first example of a rationally designed, morphology controlling mineral binding peptide. We have also synthesized a helical phosphopeptide which appears to bind to the basal face of calcite.

DTIC

Calcification; Calcite; Crystals; Deoxyribonucleic Acid; Low Temperature; Minerals; Morphology; Peptides; Polypeptides

19980010775 Purdue Univ., Mechanical Engineering Technology, West Lafayette, IN USA

Brinelling the Malay Snail

Windener, Edward L., Purdue Univ., USA; Ismail, Hasni B., Tun Hussein Onn Inst., Malaysia; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 431-435; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

Lab facilities for metals testing were under construction at the Polytechnic Staff Training Center (PSTC) when classes began. Equipment was not yet commissioned, and supplies not yet available, to test impact-toughness by ASTM E 23 method. Simple demonstrations such as swinging a pendulum (string and ball) or dropping a weight (nut or bolt) to crack a hard-boiled egg are messy or costly. Also, hens eggs have simple shape and uniform size. So, we dropped steel balls (Brinell indenter) through vertical tubes, onto empty snail shells. The common 'Lymnaea' land-snail was readily found, sun-dried and rain-washed. This practical exercise in technical problem-solving included: Measuring specimens of similar shape (variable size); Selecting target area; Holding tapered specimens; Designing a telescoping tube; Having adequate ball-to-tube clearance; Determining a failure criterion; Calculating potential energy to puncture; Plotting data (dimensionless parameters). The co-author was an undergraduate student, who subsequently ran numerous tests and measured dozens of samples. This was his senior project (capstone experience) in Mechanical Engineering in Malaysia.

Derived from text

Mechanical Engineering; Problem Solving; Steels

19980010781 Loyola Coll., Dept. of Electrical Engineering and Engineering Science, Baltimore, MD USA

In-Vivo Testing of Biomaterials

South, Joe, Loyola Coll., USA; Keilson, Suzanne, Loyola Coll., USA; Keefer, Don, Loyola Coll., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 497-511; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The objective of this work is to study issues of biocompatibility and methods of biological testing of materials (implantation), as well as learning techniques and equipment for SEM use and hardness testing. This study can be used as an ongoing lab for learning techniques and issues related to biocompatibility and in-vivo testing. The particular objective was to determine the effects of in-vivo testing upon the diamond pyramid (Vickers) hardness of the material. This is an example of one of many materials' parameters for determining overall biocompatibility of a material. Biocompatibility of materials is an important and growing area of materials science research. Many materials' parameters affect the overall usefulness of a material for long term implantation in the human body. It is important to understand the environment in which the material is meant to reside. Will it be weight bearing; what forces and stresses will it be subject to; how long will it be in place; what is the chemical environment to which it is subject (e.g. pH)? All implanted materials will elicit a response from the tissues at their interface. The most demanding situations are those that require both functional and structural support. The challenge is to minimize the compromises in form, function, biochemistry, and biomechanics. In this experiment, Bioglass(registered mark) was implanted into laboratory rats for in-vivo testing. The purpose was to survey the effects, if any, of heat treatment, duration of implantation, and composition type of Bioglass(registered mark), on the hardness of samples.

Derived from text

Biocompatibility; Implantation; Heat Treatment

19980010911 State Univ. of New York, Stony Brook, NY USA

Formation of Calcite Biocrystals; Structure and Formation of Matrix Glycoproteins *Final Report, 1 Mar. 1993 - 28 Feb. 1997*

Lennarz, William J., State Univ. of New York, USA; Feb. 28, 1997; 3p; In English

Contract(s)/Grant(s): N0004-93-I-0229

Report No.(s): AD-A331408; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The presence of proteins associated with the CaCO₃-containing biocrystals found in a wide variety of marine organisms is well established. In these organisms, including the primitive skeleton (spicule) of the sea urchin embryo, the structural and functional role of these proteins either in the biomineralization process or in control of the structural features of the biocrystals is unclear. Recently, one of the matrix proteins of the sea urchin spicule, SM30, has been shown to contain a carbohydrate chain (the 1223 epitope) that has been implicated in the process whereby Ca²⁺ is deposited as CaCO₃. Because an understanding of the localization of this protein, as well as other proteins found within the spicule, is central to understanding their function, we undertook to develop methods to localize spicule matrix proteins in intact spicules, using immunogold techniques and scanning electron microscopy. Gold particles indicative of this matrix glycoprotein could not be detected on the surface of spicules that had been isolated from embryo homogenates and treated with alkaline hypochlorite to remove any associated membranous material. However, when isolated spicules were etched for 2 min with dilute acetic acid (10 mM) to expose more internal regions of the crystal, SM30 and perhaps other proteins bearing the 1223 carbohydrate epitope were detected in the calcite matrix. These results, indicating that these two antigens are widely distributed in the spicule, suggest that this technique should be applicable to any matrix protein for which antibodies are available.

DTIC

Acetic Acid; Antibodies; Antigens; Carbohydrates; Marine Biology; Musculoskeletal System; Organisms; Position (Location); Proteins

19980011508 Environmental Protection Agency, Ada, OK USA

Chlorobenzene Bioreactor Demonstration *Final Report, Mar. - Nov. 1992*

Miller, Dennis, Environmental Protection Agency, USA; Spain, Jim, Environmental Protection Agency, USA; Wallace, William, Environmental Protection Agency, USA; Vogel, Catherine, Environmental Protection Agency, USA; Mar. 1997; 63p; In English
Contract(s)/Grant(s): MIPR-N92-16

Report No.(s): AD-A332757; EPA-RW57935105-01-1; AL/EQ-1993-0008; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The technical objective of this research was to test whether above-ground, fixed-film bioreactors can biodegrade complex mixtures of chlorinated aromatic compounds in groundwater. Specifically, the project was designed to test the metabolic capabilities of *Pseudomonas* Strain JS150 in the field. The approach involved a preliminary field study at Robins AFB GA using two

above-ground, fixed-film bioreactors, one colonized with *Pseudomonas* JS150 and one colonized with indigenous groundwater bacteria, to measure degradation of chlorinated aromatic compounds. Independent variables measured included temperature, pH, dissolved oxygen, and fluctuations in microbial populations. Results from the bench-scale column study indicated that the JS150 isolate had the greatest number of desirable qualities and would be the best selection to utilize in a biofilm reactor. Results from the study indicate that both reactors provided substantial chlorobenzene removal (greater than 95%). Data indicate that bioreactor inoculation may be useful for reducing startup time. No degradation intermediates were detected from either the inoculated or uninoculated reactors.

DTIC

Bioreactors; Inoculation; Chlorination; Ground Water; Bacteria; Strain Distribution; Scale Models

19980011547 NASA Ames Research Center, Moffett Field, CA USA

An Evaluation of the Frequency and Severity of Motion Sickness Incidences in Personnel Within the Command and Control Vehicle (C2V)

Cowings, Patricia S., NASA Ames Research Center, USA; Toscano, William B., NASA Ames Research Center, USA; DeRoshia, Charles, NASA Ames Research Center, USA; Jan. 1998; 28p; In English

Contract(s)/Grant(s): RTOP 199-14-12; IA-BLI-88

Report No.(s): NASA/TM-98-112221; NAS 1.15:112221; A-98-09480; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this study was to assess the frequency and severity of motion sickness in personnel during a field exercise in the Command and Control Vehicle (C2V). This vehicle contains four workstations where military personnel are expected to perform command decisions in the field during combat conditions. Eight active duty military men (U.S. Army) at the Yuma Proving Grounds in Arizona participated in this study. All subjects were given baseline performance tests while their physiological responses were monitored on the first day. On the second day of their participation, subjects rode in the C2V while their physiological responses and performance measures were recorded. Self-reports of motion sickness were also recorded. Results showed that only one subject experienced two incidences of emesis. However, seven out of the eight subjects reported other motion sickness symptoms; most predominant was the report of drowsiness, which occurred a total of 19 times. Changes in physiological responses were observed relative to motion sickness symptoms reported and the different environmental conditions (i.e., level, hills, gravel) during the field exercise. Performance data showed an overall decrement during the C2V exercise. These findings suggest that malaise and severe drowsiness can potentially impact the operational efficiency of the C2V crew. It was concluded that conflicting sensory information from the subject's visual displays and movements of the vehicle during the field exercise significantly contributed to motion sickness symptoms. It was recommended that a second study be conducted to further evaluate the impact of seat position or orientation and C2V experience on motion sickness susceptibility. Further, it was recommended that an investigation be performed on behavioral methods for improving crew alertness, motivation, and performance and for reducing malaise.

Author

Human Performance; Motion Sickness; Physiological Responses; Physiological Tests; Psychophysiology

19980011620 Tennessee Univ., Medical Center, Knoxville, TN USA

Spaceflight Associated Apoptosis Final Report

Ichiki, Albert T., Tennessee Univ., USA; Gibson, Linda A., Tennessee Univ., USA; Allebban, Zuhair, Tennessee Univ., USA; 1996; 28p; In English

Contract(s)/Grant(s): NAG2-494

Report No.(s): NASA/CR-96-206706; NAS 1.26:206706; Rept-96-I-15V; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Lymphoid tissues have been shown to atrophy in rats flown on Russian spaceflights. Histological examination indicated evidence for cell degradation. Lymphoid tissues from rats flown on Spacelab Life Sciences-2 mission were analyzed for apoptosis by evidence of fragmented lymphocytes, which could be engulfed by macrophages, or DNA strand breaks using the terminal deoxynucleotidyl transferase-mediated dUTP nick end-labeling (TUNEL) assay. Apoptosis was not detected in the thymus and spleen collected inflight or from the synchronous ground rats but was detected in the thymus, spleen and inguinal lymph node of the flight animals on recovery. These results indicate that the apoptosis observed in the lymphatic tissues of the rats on recovery could have been induced by the gravitational stress of reentry, corroborating the findings from the early space-flight observations.

Author

Space Flight; Cells (Biology); Gravitational Effects; Lymph; Deoxyribonucleic Acid; Biological Effects; Tissues (Biology)

19980011639 Virginia Polytechnic Inst. and State Univ., Blacksburg, VA USA

Basic Research Effort Toward Development of a Vaccine Against Human Brucellosis; Identification of Protective Brucella Antigens and Their Expression in Vaccinia Virus to Prevent Disease in Animals and Humans *Annual Report, 1 May 1996 - 30 Apr. 1997*

Schurig, Gerhardt G., Virginia Polytechnic Inst. and State Univ., USA; Sep. 1997; 22p; In English

Contract(s)/Grant(s): DAMD17-94-C-4042

Report No.(s): AD-A332973; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This project intends to identify Brucella antigens which are likely to stimulate Th1 responses (with production of INF-gamma) with lymphocytes from vaccinated mice and therefore, are likely to have a role in the induction of protective immunity against brucellosis. Once such antigens have been identified, the genes encoding those antigens will be isolated, sequenced and their products will be characterized. Using these genes, recombinant vaccinia viruses will be constructed.

DTIC

Vaccines; Antigens; Viral Diseases; Research

19980011975 Purdue Univ., Agricultural and Biological Engineering Dept., West Lafayette, IN USA

Physiological Response of Plants Grown on Porous Ceramic Tubes *Final Report*

Tsao, David, Purdue Univ., USA; Okos, Martin, Purdue Univ., USA; Jul. 1997; 374p; In English

Contract(s)/Grant(s): NAG10-112

Report No.(s): NASA/CR-97-206741; NAS 1.26:206741; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This research involves the manipulation of the root-zone water potential for the purposes of discriminating the rate limiting step in the inorganic nutrient uptake mechanism utilized by higher plants. This reaction sequence includes the pathways controlled by the root-zone conditions such as water tension and gradient concentrations. Furthermore, plant based control mechanisms dictated by various protein productions are differentiated as well. For the nutrients limited by the environmental availability, the kinetics were modeled using convection and diffusion equations. Alternatively, for the nutrients dependent upon enzyme manipulations, the uptakes are modeled using Michaelis-Menten kinetics. In order to differentiate between these various mechanistic steps, an experimental apparatus known as the Porous Ceramic Tube - Nutrient Delivery System (PCT-NDS) was used. Manipulation of the applied suction pressure circulating a nutrient solution through this system imposes a change in the matric component of the water potential. This compensates for the different osmotic components of water potential dictated by nutrient concentration. By maintaining this control over the root-zone conditions, the rate limiting steps in the uptake of the essential nutrients into tomato plants (*Lycopersicon esculentum* cv. Cherry Elite) were differentiated. Results showed that the uptake of some nutrients were mass transfer limited while others were limited by the enzyme kinetics. Each of these were adequately modeled with calculations and discussions of the parameter estimations provided.

Author

Physiological Responses; Plants (Botany); Porous Materials; Mathematical Models; Reaction Kinetics; Ceramics

52

AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and effects of weightlessness on man and animals.

19980009140 Royal Inst. of Tech., Dept. of Mathematics, Stockholm, Sweden

Time to Extinction in Recurrent Epidemics

Nasell, I., Royal Inst. of Tech., Sweden; Jun. 06, 1997; 37p; In English

Report No.(s): PB97-208995; TRITA-MA-97-MA-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new approximation is derived for the expected time to extinction in a stochastic model for recurrent epidemics. Numerical illustrations indicate that the approximation has correct order of magnitude, but that improvements are required. The quasi-stationary distribution plays an important role in the derivation. Approximations of the critical community size and of the persistence threshold are derived. Comments are made on the classical study by Bartlett (1956-1960).

NTIS

Epidemiology; Mathematical Models; Stochastic Processes; Communities

19980009275 Defence Science and Technology Organisation, Defence Food Science Centre, Canberra, Australia

Review of Methods of Improving the Intake and Absorption of Water into the Body by the Use of Alternative Supply Methods and/or Additives

Thomson, G. F., Defence Science and Technology Organisation, Australia; Walker, G. J., Defence Science and Technology Organisation, Australia; Forbes-Ewan, C. H., Defence Science and Technology Organisation, Australia; May 1997; 32p; In English Report No.(s): AD-A329907; DSTO-TR-0483; DODA-AR-010-119; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Defence personnel working in the heat run the risk of heat illnesses and decreased performance due to hypohydration. Physiological, psychological and mechanical methods for improving the intake and absorption of water into the body are discussed. Recommendations include evaluation of the effectiveness and service suitability of

DTIC

Heat Tolerance; Psychological Effects; Water; Heat Stroke; Dehydration; Risk

19980009506 Consiglio Nazionale delle Ricerche, Ist. di Analisi dei Sistemi ed Informatica, Rome, Italy

Binding of L-Tryptophan to Human Serum Albumin and Competition with Indole-3-Acetic Acid

Gandolfi, A., Consiglio Nazionale delle Ricerche, Italy; Mingrone, G., Consiglio Nazionale delle Ricerche, Italy; Bertuzzi, A., Consiglio Nazionale delle Ricerche, Italy; Greco, A. V., Consiglio Nazionale delle Ricerche, Italy; Vanholder, R., Consiglio Nazionale delle Ricerche, Italy; May 1994; 19p; In English

Report No.(s): PB96-152517; Copyright Waived (NASA); Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The level of free tryptophan and its metabolites in serum appears to be related to some pathologic states, such as chronic renal failure and neuropsychiatric disorders, so that a precise characterization of tryptophan binding to serum albumin is of interest. In the paper, the binding of L-tryptophan to defatted human serum albumin at 37 degrees C and pH 5, 7.4, and 8.5 was studied by means of equilibrium dialysis. In addition, the competition between L-tryptophan and indole-3-acetic acid was investigated at pH 7.4, as well as the binding of L-tryptophan in human serum. We found for the binding to defatted albumin one site with association constant $1.04 \times 10^4 \text{ M}^{-1}$ at pH 7.4, and 0.52 sites per albumin molecule with association constant $10.59 \times 10^4 \text{ M}^{-1}$ at pH 8.5. Negligible binding was found at pH 5. The competition experiment suggested that one specific site on albumin is common for L-tryptophan and indole-3-acetic acid, but the data were not adequately predicted by a purely competitive scheme.

NTIS

Acetic Acid; Tryptophan; Serums; Albumins

19980009537 Consiglio Nazionale delle Ricerche, Ist. di Analisi dei Sistemi ed Informatica, Rome, Italy

Binding of Indole-3-Acetic Acid to Human Serum Albumin

Bertuzzi, A., Consiglio Nazionale delle Ricerche, Italy; Mingrone, G., Consiglio Nazionale delle Ricerche, Italy; Gandolfi, A., Consiglio Nazionale delle Ricerche, Italy; Greco, A. V., Consiglio Nazionale delle Ricerche, Italy; Ringoir, S., Consiglio Nazionale delle Ricerche, Italy; May 1994; 19p; In English

Report No.(s): PB96-152509; Copyright Waived (NASA); Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Indole-3-acetic acid, a product of tryptophan metabolism, is commonly considered to be a uremic toxin. Protein binding may affect the free concentration and hence the toxicity of this compound. In the present paper, the binding of indole-3-acetic acid to defatted human serum albumin at 37 degrees C and pH 5, 7.4, and 8.5 was studied by equilibrium dialysis. The binding of indole-3-acetic acid in human serum was also investigated. Binding to defatted albumin was analyzed by a mathematical model assuming two independent high affinity binding sites plus a class of low affinity sites. For the site with highest affinity we found the following association constants: $6.80 \times 10^3 \text{ M}^{-1}$ at pH 5, $8.96 \times 10^3 \text{ M}^{-1}$ at pH 7.4, and $5.25 \times 10^3 \text{ M}^{-1}$ at pH 8.5. In addition, a large number of low affinity sites was evidenced. The pH dependence of the highest affinity constant was investigated by a theoretical model.

NTIS

Serums; Acetic Acid; Albumins; Indoles; Mathematical Models

19980009630 Georgetown Univ., Washington, DC USA

Phase I Evaluation of Desbutylhalofantrine in Healthy Volunteers Annual Report, 15 Sep. 1996 - 14 Sep 1997

Abernethy, Darrell R., Georgetown Univ., USA; Sep. 1997; 105p; In English

Contract(s)/Grant(s): DAMD17-96-C-6102

Report No.(s): AD-A332082; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The study design was a randomized, double-blind, placebo-controlled Phase 1 safety and tolerance study. Twenty-one healthy volunteers were randomly assigned to receive halofantrine or placebo. Initially it was planned to study 16 subjects, with 12 subjects to receive active drug (halofantrine) and 4 subjects to receive placebo, however due to subject dropouts prior to study completion, the number to be enrolled was increased to increase the number of subjects who completed the entire study. The blind was maintained with the increase in sample size accomplished by stratified randomization. Subjects were dosed daily for 42 days with 500 mg halofantrine hydrochloride. Subjects fasted for at least 2 hours prior to and 2 hours following the oral dose. The initial 21 days of drug administration were done with subjects confined as inpatients to the the Georgetown University Medical Center Clinical Research Center and the remaining 21 days of drug administration the subject reported daily to the Clinical Research Center for medical assessment and supervised drug administration. The subjects were then followed periodically for the next 4 1/2 months with medical assessments and pharmacokinetic sampling at the Clinical Research Center.

DTIC

Physiological Effects; Medical Science; Sampling; Physiological Tests

19980009784 Technische Univ., Eindhoven, Netherlands

Validation of the Quadriphasic Mixture Theory for Intervertebral Disc Tissue

Frijns, A. J. H., Technische Univ., Netherlands; Huyge, J. M., Technische Univ., Netherlands; Janssen, J. D., Technische Univ., Netherlands; Nov. 1996; 21p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-204937; RANA-96-22; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The selling and shrinking behavior of soft biological tissues is describes by a quadriphasic mixture model. In this model four phases are distinguished: a charged solid, a fluid, cations and anions. A description of the set of coupled differential equations of this quadriphasic mixture model is given. These equations are solved by the finite element method using a weighted residual approach. The resulting non-linear integral equations are linearized and solved by the Newton-Raphson iteration procedures. We performed some confined swelling and compression experiments on intervertebral disc tissue. These experiments are simulated by a one-dimensional finite element implementation of this quadriphasic mixture model.

NTIS

Differential Equations; Integral Equations; Newton-Raphson Method; Finite Element Method; Spine; Swelling

19980009880 Geo-Centers, Inc., Newton, MA USA

Research on Navy-Related Combat Casualty Care Issues, Navy Operational-Related Injuries and Illnesses and Approaches to Enhance Navy/Marine Corps Personnel Combat Performance *Quarterly Report, 1 Jun. - 31 Aug. 1997*

Oct. 06, 1997; 100p; In English

Contract(s)/Grant(s): N00014-95-D-0048

Report No.(s): AD-A330584; GC-PR-2728-003; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This report summarizes the results of GEO-CENTERS' technical activities for the first option year one of the Naval Medical Research Institute (NMRI) Contract N00014-95-D-0048, Delivery Orders 002, 003 and 004. The delivery orders encompass a variety of scientific studies that are capable of supporting ongoing and projected programs under the cognizance of NMRI; NMRI TOX/DET-Dayton, OH; NMRI/DET-San Antonio, TX; NDRI-Great Lakes, IL; the NDRI Detachment-Bethesda, MD; the National Naval Medical Center-Bethesda, MD; and the U.S. Navy Clothing and Textile Facility-Natick, MA. The format for these periodic technical progress reports consists of four sections each listed by the location of the research. The sections are: (1) Descriptions of work to be performed; (2) Objectives planned for the current reporting period; (3) Summary of work performed during current reporting period; and (4) Objectives for the next reporting period. Accumulated scientific reports, technical reports and journal articles are being provided as part of this quarterly technical progress report. Specifically, the research conducted by GEO-CENTERS during this quarterly reporting period has been focused on the following general scientific programs: (1) Infectious disease threat assessment and preventive medicine programs; (2) Immune cell biology, wound repair and artificial blood studies; (3) Biomedical diving programs; (4) Personnel performance enhancement programs; (5) Breast Care Center; (6) Directed Energy Effects Research; (7) Dental related diseases; (8) Toxicological studies; and (9) Human Performance and U.S. Navy Clothing Development.

DTIC

Injuries; Military Technology; Medical Services; Wound Healing; Prevention; Casualties

19980009947 Naval Postgraduate School, Monterey, CA USA

Analysis of The Medical Augmentation Program

Boufford, John R., Naval Postgraduate School, USA; Mar. 1997; 72p; In English

Report No.(s): AD-A332238; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This thesis reviews medical readiness in the U. S. Navy. Data from multiple sources were used to analyze medical readiness issues. Analysis shows that Navy medical readiness needs to improve. Recommendations address the formulation of a readiness organization within the Military Treatment Facility (MTF). This organization would utilize the existing MTF organization and provide continuity, command involvement, and a means for continuous improvement.

DTIC

Augmentation; Modulation Transfer Function; Navy; Medical Services

19980009989 Johns Hopkins Univ., Baltimore, MD USA

Structural Indices of Stress Fracture Susceptibility in Female Military Recruits *Annual Report, 22 Sep. 1996 - 21 Sep. 1997*

Beck, Thomas J., Johns Hopkins Univ., USA; Oct. 1997; 12p; In English

Contract(s)/Grant(s): DAMD17-95-2-5027

Report No.(s): AD-A332132; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A study was undertaken to examine stress fracture susceptibility in female US Marine Corps recruits, using anthropometry and bone structural measurements derived from dual energy x-ray absorptiometry (DEXA) scans of the femur and lower leg. A total of 671 recruits received anthropometry and DEXA scans at the onset of training and were followed to ascertain stress fractures. A total of 36 recruits (5.2%) suffered stress fractures; 13 cases were in the foot, 10 each in the pelvic girdle and lower leg, and 9 in the femur. Fracture cases were pooled and compared with non-fracture cases. Results show that BMD, cross-sectional geometry, strength indices, and mean cortical thicknesses of the femur and tibia were significantly lower in cases than in controls, suggesting relatively weaker bone strength of the lower limbs of fracture cases, a result also seen earlier in males. In the male however, small body size predisposed to stress fracture, but in the generally smaller female, body size was unimportant. Moreover male stress fractures were predominantly below the knee (81%), while more than half (53%) of female cases were in the femur or pelvic girdle. When pelvic stress fractures were separately compared to controls, only pelvic and intertrochanteric breadths corrected for body weight, were significantly larger in cases. This suggests that a relatively wide pelvis is a risk factor for pelvic stress fracture and considering the narrow male pelvis may explain why pelvic stress fractures is a female phenomenon.

DTIC

Fracturing; Femur; Leg (Anatomy)

19980009998 Pennsylvania Univ., Dept. of Psychiatry, Philadelphia, PA USA

A Genetic Approach to Mammalian Circadian Rhythms *Final Report, 1 May 1994 - 30 Apr. 1997*

Bucan, Maja, Pennsylvania Univ., USA; Jan. 1995; 6p; In English

Contract(s)/Grant(s): F49620-94-I-0234; AF Proj. 2312

Report No.(s): AD-A330711; AFOSR-TR-97-0525; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We have developed a routine procedure for random mutagenesis in the mouse and have demonstrated the feasibility of rapidly screening for aberrant behavioral parameters. We believe that this classical genetic approach, as well as the screening of progeny of mutagenized mice for altered sequence and/or expression pattern prior to phenotypic analysis, will play an important role in the elucidation of the functional content of the mammalian genome.

DTIC

Aberration; Abnormalities; Circadian Rhythms; Genetics

19980010019 Armstrong Lab., Wright-Patterson AFB, OH USA

The Effect of Menstrual Phase and Oral Contraceptives on Female Adaptation and Performance at High G *Final Report, 22 Dec. 1995 - 31 Mar. 1997*

Chelette, Tamara, Armstrong Lab., USA; Mar. 1997; 38p; In English

Contract(s)/Grant(s): MIPR-96MM6647

Report No.(s): AD-A330011; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Females are now flying combat aircraft in the Air Force. Questions of gender differences regarding adaptation and performance in the high-G environment (9G) must be studied scientifically. The Dynamic Environment Simulator, a three-axis centrifuge with closed-loop flight simulation, provides the laboratory to investigate these issues. The eight women in this high-G performance study did not show cardiovascular adaptation to high-G, whereas the eight men did. Both genders showed increased leg calf compliance indicating possible chronic vascular effects. No echocardiographic evidence of heart damage was found. The women demonstrated half the strength of the men, but displayed similar G tolerance and endurance. The women showed less oxygen desaturation of brain tissue than the men during high-G exposure. The women did not perform the simulated air-to-air combat sortie quite as well as the men, though there was no effect of menstrual cycle on their ability to complete the mission. There was

also no effect of high-G exposure on the length of the female monthly cycle, regardless of oral contraceptive use. Women demonstrated acceptable tolerance to and performance during simulated high-G aerial combat, without menstrual effect, even in light of their reduced muscular strength and cardiovascular adaptation as compared to men.

DTIC

Gravitational Effects; Feedback Control; Flight Simulation; Females; Fighter Aircraft; Muscular Strength; Oxygen; Echocardiography; Desaturation

19980010027 Iowa Univ., Iowa City, IA USA

Use of Biomarkers to Optimize Heat Acclimation in Women *Annual Report, 25 Sep. 1996 - 24 Sep. 1997*

Giolfi, Carl V., Iowa Univ., USA; Oct. 1997; 20p; In English

Contract(s)/Grant(s): DAMD17-95-C-5093

Report No.(s): AD-A332062; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The effects of estrogen supplementation (ES) on heat acclimation was studied in 14 premenopausal females (18-35 yrs old) randomly assigned to either ES or placebo (P) groups after being matched for VO₂ max, percent body fat, and body weight/surface area ratio. Four days after the onset of menstruation they performed 2-h bouts of treadmill exercise (35-45% VO₂ max) daily in the heat (45°C, 20% RH) until acclimated. On day 2 of the menstrual cycle, subjects ingested either 13-estradiol tablets (6 mg/day) or placebo tablets, for 7 d. Based on thermal and circulatory measures, 11SP70 synthesis, and days to achieve acclimation, we conclude that ES, as performed in this study, had no effect on heat acclimation. In the animal study, rats received daily subcutaneous injections of estradiol (10 ug/100 ml/g b.w.). One group underwent a daily exertional heating protocol (trained) and a second group served as sham controls (untrained). Within each group, 3 subgroups were utilized to assess the time course of potential alterations: (a) 4-day, (b) 8-day, or (c) 12-day. On the final day of a protocol, rats underwent a heat tolerance test consisting of treadmill exercise at 21.5 m/min at 35°C until colonic temperature (T_c) reached 40.40°C. In general, rats in the trained group had lower body weights, reduced resting T_c's, attenuated heating rates, and increased run times to 40.40°C (P less than 0.05) than their untrained counterparts. These results were primarily manifested in rats trained for 8 or 12 days compared with the 4-day treatment group. These studies demonstrate that the combination of exertional heat exposure and estradiol treatment, when compared to estradiol supplementation alone, enhances thermotolerance in rats exercising at a high ambient temperature.

DTIC

Estrogens; Heat Tolerance; Heat Acclimatization; Physiological Tests; Physiological Effects

19980010037 Johns Hopkins Univ., School of Medicine, Baltimore, MD USA

Glycosphingolipids as Putative Receptor for Staphylococcal Enterotoxin-B in Cultured Human Kidney Cells *Final Report, 1 Aug. 1994 - 31 Jul. 1997*

Chatterjee, Subroto, Johns Hopkins Univ., USA; Aug. 1997; 25p; In English

Contract(s)/Grant(s): DAMD17-94-C-4059

Report No.(s): AD-A332016; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Staphylococcal enterotoxin-B (SEB) is a common enterotoxin that can cause diarrhea and death in man. In these studies we have developed a specific and sensitive assay for the detection of SEB (enzyme linked receptor-based immunodot) in human fluids, plasma and urine. Our structure/function studies have revealed that amino acid sequence (130-160) of SEB (peptide #9) imparts toxic effects including cell death in PT cells. In addition, we found that SEB can activate neutral sphingomyelinase (N-SMase) resulting in the hydrolysis of sphingomyelin to ceramide and phosphocholine. Ceramide, in turn induces programmed cell death (apoptosis). Interestingly, several of the SEB mutants of peptide #9 were found to abrogate SEB toxicity in human kidney cells. Our findings will of potential value for the food industry, and to help determine toxemia in our soldiers. Such studies will also elaborate the pathophysiology of SEB induced toxemia in man.

DTIC

Microorganisms; Staphylococcus; Kidneys; Cells (Biology); Pathogens

19980010111 Brigham and Women's Hospital, Boston, MA USA

Clinical Trial of the Effect of Exercise on Endogenous Circadian Period, Sleep and Performance *Final Report, 1 Jul. 1994 - 30 Jun. 1997*

Czeisler, Charles A., Brigham and Women's Hospital, USA; Aug. 29, 1997; 7p; In English

Contract(s)/Grant(s): F49620-94-I-0398; AF Proj. 2312

Report No.(s): AD-A329706; AFOSR-97-0388TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

In summary, the addition of the research studies conducted in year three of the project solidifies the notion that regular bouts of aerobic exercise affect the physiology of the thermoregulatory system in a phase-dependent manner. Preliminary results from

the reaction time data continue to be extremely promising. These data suggest that aerobic exercise may have the potential to enhance neurobehavioral performance, as reflected by simple visual reaction time, particularly at the nadir of the temperature cycle where neurobehavioral deficits are known to be the greatest.

DTIC

Circadian Rhythms; Exercise Physiology; Thermoregulation

19980010175 Arizona Univ., Tucson, AZ USA

The Effects of Chronic JP-8 Jet Fuel Exposure on Lung Function Final Report, 15 May 1994 - 14 May 1997

Witten, Mark L., Arizona Univ., USA; May 14, 1997; 7p; In English

Contract(s)/Grant(s): F49620-94-1-0297; AF Proj. 2312

Report No.(s): AD-A330006; AFOSR-TR-97-0512; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The past three years of work for the Air Force Office of Scientific Research has resulted in the development of a congenic mouse model of JP-8 jet fuel exposure, the role of substance P in the JP-8 jet fuel-induced lung injury process, and development of extensive collaborations with Dr David Harris (University of Arizona), Drs Korngut and Siegel (University of Wisconsin), and Dr Frank Witzman (Indiana University). We demonstrated that congenic mice deficient in the aryl hydrocarbon hydroxylase and N-acetyl transferase enzymes have increased lung permeability and pathological lung injury resulting from exposure to JP-8 jet fuel compared to their C57BL/6 parent strain. Consequently, we can conclude that one or both of these enzymes plays a role in the metabolism of JP-8 fuel in the lungs. Finally, we have conducted field studies for JP-8 jet fuel exposure at the Montana Air National Guard Base in Great Falls, Montana in March of 1997 and at Davis Montana Air Force Base in Tucson, Arizona. The purpose of this semi-cold weather (30 degree) F-16A engine start and warm weather (102 degree) F-16A engine start were to determine real-life JP-8 jet fuel exposures at the ground crew positions and determine average JP-8 jet fuel concentration and particle size. The data was then compared against similar data generated in our JP-8 jet fuel exposure model.

DTIC

JP-8 Jet Fuel; Lungs; Exposure; Ground Crews; Hydrocarbons; Injuries

19980010448 Oklahoma State Univ., Stillwater, OK USA

Effect of Sub-Lethal Organic and Metallic Toxicant Concentrations on Neurological Biomarkers of Neonates Final Report, 7 Apr. 1995 - 6 Apr 1996

Blankemeyer, James T., Oklahoma State Univ., USA; May 1996; 288p; In English

Contract(s)/Grant(s): DAMD17-95-2-5008

Report No.(s): AD-A328856; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

Exposure of humans to lethal or clearly harmful levels of toxicants is straightforward to assess. Counting the number of survivors or enumerating injuries provides an accurate, repeatable method for assessing toxicant effect. However, chronic exposure to very low levels of toxicants is much more problematic. Effects to very low levels of toxicants often produces effects temporally separate from exposure and not linkable in a cause and effect relationship. Our study probed the relationship between low levels of toxicants and neurological responses. After exploratory assays of various neurotoxic chemicals, we used trimethyltin to assess neurological damage to embryos, the most sensitive stage of the life cycle. We found that we were able to detect these low levels of trimethyltin by video image analysis of neural fields using the electrochromic dye Di-4-ANEPPS. We also used analysis of retrograde transport of scrape-loaded tracer dye through neurons. We found that there was no detectable difference in the neuronal paths traced by the tracer dye.

DTIC

Embryos; Enumeration; Neurophysiology; Neurology; Life (Durability); Assaying; Image Analysis

19980010526 Armstrong Lab., Aerospace Medicine Directorate, Brooks AFB, TX USA

Autonomic Functions Associated with Blood Pressure Regulation and Orthostatic Performance in Women Final Report, 22 Dec. 1995 - 31 Aug. 1997

Convertino, Victor A., Armstrong Lab., USA; Oct. 1997; 37p; In English

Contract(s)/Grant(s): AF Proj. 7755

Report No.(s): AD-A331912; AL/AO-TR-1997-0129; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Functions of baroreflex control of heart rate and vascular resistance, adrenoceptor responsiveness, indices of baseline vagal and sympathetic tone, plasma volume, and venous compliance were compared in men and women to test the hypothesis that greater orthostatic intolerance in women would be associated with impairment of specific mechanisms of blood pressure regulation. Heart rate (HR), stroke volume (SV), cardiac output (Q), mean arterial blood pressure (MAP), forearm (FVR) and leg (LVR) vascular resistance, catecholamines (NE), and changes in leg volume (%LV) were measured during various protocols of lower

body negative pressure (LBNP), carotid stimulation, and infusions of adrenoreceptor agonists in 10 females and 10 males matched for age and fitness. LBNP tolerance for women (797 +/- 63 mmHg min) was 35% lower than for men. At presyncope, SV, Q, MAP and %LV were tolerance in females was associated with impairment of the heart rate response to carotid baroreceptor stimulation, lower baseline cardiac vagal activity, greater decline in Q and SV induced by LBNP, increased B1-adrenoreceptor responsiveness, greater vasoconstriction under equal LBNP, lower levels of NE at presyncope, and lower blood volume. Results support the hypothesis that women have significant deficiencies in mechanisms that underlie blood pressure regulation under orthostatic challenge. These findings should be considered in selection and training of women for military combat, especially in combat missions requiring high-G aerial maneuvers.

DTIC

Blood Pressure; Physiological Tests; Autonomic Nervous System; Physiological Responses; Orthostatic Tolerance; Females

19980010848 Army Research Inst. of Environmental Medicine, Military Nutrition and Biochemistry Div., Natick, MA USA
The Use of Caffeine to Enhance Cognitive Performance, Reaction Time, Vigilance, Rifle Marksmanship and Mood States in Sleep-Deprived Navy SEAL (BUD/S) Trainees, Jun. 1995 - Oct. 1997

Coffey, Bryan, Army Research Inst. of Environmental Medicine, USA; Strowman, Shelley. R., Army Research Inst. of Environmental Medicine, USA; Tulley, Richard, Louisiana State Univ., USA; Tharion, William. J., Geo-Centers, Inc., USA; Shukitt-Hale, Barbara, Geo-Centers, Inc., USA; Desai, Manoj, Geo-Centers, Inc., USA; Oct. 1997; 102p; In English
Report No.(s): AD-A331982; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Caffeine has been shown to improve tasks with a vigilance component. The purpose of this study was to determine the effectiveness of caffeine in sleep-deprived individuals exposed to high levels of operational and environmental stress. Volunteers were 68 Navy SEAL trainees. Volunteers were administered caffeine (100, 200, 300 mg or placebo) after 72 hrs of sleep deprivation. Performance testing occurred 1-1.5 hrs and 8-10 hrs after caffeine or placebo administration. Tests included auditory and visual vigilance tests, four-choice reaction time, matching to sample, repeated acquisition, rifle marksmanship, mood and subjective sleepiness assessment. The combined effects of sleep deprivation and the operational and environmental stress of training significantly affected all measures adversely (ANOVAs, p less than 0.05 to 0.0001). Caffeine (200 or 300 mg) significantly improved (p less than 0.05) visual vigilance, reaction time, repeated acquisition, mood and alertness measures compared to placebo when sleep-deprived. Marksmanship was not affected by caffeine.

DTIC

Sleep Deprivation; Caffeine; Mental Performance; Reaction Time; Physiological Effects; Physiological Tests

19980010970 Colorado Univ., Denver, CO USA

Women at Altitude: Effects of Menstrual Cycle Phase and Alpha-Adrenergic Blockage on High Altitude Acclimatization Annual Report

Moore, Lorna G., Colorado Univ., USA; Oct. 1997; 17p; In English

Contract(s)/Grant(s): DAMD17-95-C-5110

Report No.(s): AD-A331527; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Little is known concerning the effects of high altitude exposure in women. In year 1, we evaluate the effects of menstrual cycle phase on high altitude acclimatization. Results indicated that the effects of the menstrual cycle were modest on the ventilatory, circulatory and metabolic responses hypoxia but that the volume regulatory adjustments were altered such that there tended to be greater fluid retention in the luteal phase subjects. The purpose of the studies conducted in year 2 (the present annual report) was to determine the role of alpha-1 adrenergic activity and its interaction with menstrual cycle phase in early altitude acclimatization. Fifteen young women were exposed to an effective altitude of 300 m in the USARIEM hyperbaric chamber for 52 hr on two occasions, once while being treated with an alpha-1 blocker (prazosin) in a randomized, double blind fashion. Definite alpha-1 adrenergic blockage was achieved as demonstrated by a rightward shift in the blood pressure response to an alpha-adrenergic agonist, phenylephrine. Prazosin blocked the altitude-associated rise in systemic blood pressure during exercise and after tilt. Hematocrit was lower in alpha-blocked than placebo-treated subjects, implying a relaxation of venous tone, but this effect appeared similar at low and high altitudes. Ventilation, hypoxic and hypercapnic ventilatory responses were unaffected by alpha-1 adrenergic blockade at either altitude. Analyses are continuing on other variables. Thus, the information obtained suggests that alpha-1 adrenergic activation is a key factor in orthostatic and exercise-related elevations in blood pressure at high altitude, in keeping with the study hypothesis.

DTIC

Menstruation; Altitude Acclimatization; Physiological Tests; High Altitude Environments; Hemodynamic Responses

19980011574 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Frequency of Use and Cost of Selected Anesthetic Induction and Neuromuscular Blocking Agents

Anderson, Lorene R., Air Force Inst. of Tech., USA; Oct. 02, 1997; 82p; In English

Report No.(s): AD-A329980; AFIT/CI-97-034; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The purpose of this study was to identify the most frequently used agents for induction and neuromuscular blockade for intubation, and to identify variables which affected these choices. Anesthetic records (n=77) were obtained to examine the frequency of use of induction agents and neuromuscular blockers. Anesthesia care providers completed a survey (n=19) which provided information on induction and neuromuscular relaxation agent preferences, factors influencing their choices, and estimated costs of anesthesia induction and neuromuscular relaxation drugs. Cost estimates were compared to published costs of selected anesthesia drugs. The average cost of each of four combinations of induction and neuromuscular relaxation agents was compared to the average PACU time. Propofol was found to be the most frequently used agent for induction (75.3%). Succinylcholine was chosen most often for use as a neuromuscular relaxation agent (98.7%). The three most important factors influencing the choice of either agent was the physical status of the patient, the incidence of side effects produced by the drug, and the duration of action of the drug. Patients who received propofol had a shorter PACU stay (x=92.3 minutes) than those patients who received sodium thiopental (x=110.5 minutes). The estimated cost for propofol/succinylcholine per patient was \$11.16 versus \$2.38 for sodium thiopental/ succinylcholine. Based on a cost of \$8.12 per minute for PACU care, the cost savings was estimated to be \$139.00 for a patient who received propofol/succinylcholine compared to a patient who received sodium thiopental/succinylcholine.

DTIC

Neuromuscular Transmission; Anesthetics; Blocking

19980011622 Army Research Inst. of Environmental Medicine, Natick, MA USA

The Effect of Choline Supplementation on Physical and Mental Performance of Elite Rangers, Aug. - Sep. 1995

Warber, John P., Army Research Inst. of Environmental Medicine, USA; Patton, John F., Army Research Inst. of Environmental Medicine, USA; Tharion, William J., Army Research Inst. of Environmental Medicine, USA; Popp, Kathryn A., Army Research Inst. of Environmental Medicine, USA; Mello, Robert P., Army Research Inst. of Environmental Medicine, USA; Nov. 1997; 106p; In English

Report No.(s): AD-A331975; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Dietary availability of choline, the precursor of the neurotransmitter, acetylcholine, is sufficient to provide the body's requirements under normal conditions. However, some reports indicated plasma choline levels fall following certain types of strenuous exercise and that depletion of choline may limit performance, while oral supplementation may delay fatigue. A double-blind cross-over design was used to determine the relationship between plasma choline and fatigue during and after a 4 hr strenuous exercise. Fourteen Army Rangers participated in this study (ages 19-33 years, mean body fat 11% and VO₂ max 60.3 ml. kg⁻¹ min⁻¹). Thirty mins after drinking a nonnutritive beverage with or without choline citrate (8.425 g), Rangers walked on a treadmill at 5.6 km/h, 3% grade, wearing a 29.5 kg rucksack for 20 km, equivalent to approximately 1950 Kcal energy expenditure. An identical dose of the choline supplement was given mid way through the treadmill walk. Post-test mn time-to-exhaustion, squat test, perceived exertion, marksmanship, short-term memory, mood states, lactate, glucose, CPK, lipids, and plasma choline were measured. Choline levels increased 128% after the mn-to-exhaustion during the choline supplemented phase but remained stable under the placebo conditions. No significant effects were seen with choline supplementation on any measures. Consequently, plasma choline was not depleted as a result of a weighted road march, a typical Ranger performance task, nor did the Rangers benefit from choline supplementation to enhance or delay fatigue under this exhaustive military task.

DTIC

Acetyl Compounds; Adipose Tissues; Choline; Citrates; Depletion; Diets; Dosage; Drinking; Exhausting; Exhaustion; Glucose; Lactates; Lipids; Memory; Mental Performance

19980011643 William Beaumont Army Hospital, El Paso, TX USA

**Impact of Smoking on Aerobic and Anaerobic Performance During Upper and Lower Body Exercise in Female Soldiers
Final Report, 1 Dec. 1994 - 31 Dec. 1995**

Weisman, Idelle M., William Beaumont Army Hospital, USA; Apr. 1996; 49p; In English

Contract(s)/Grant(s): MIPR-95MM5548

Report No.(s): AD-A332993; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The impact of smoking on exercise performance of female soldiers is of interest to the military. Objectives: to study in female soldiers: (a) the chronic/acute effects of smoking on aerobic/anaerobic performance during lower/upper body exercise, (b) the aerobic/anaerobic capacity for lower/upper body exercise and to correlate these values with the Army physical fitness test (APFT). Methods: Healthy female soldiers, 12 smokers, after abstaining from smoking (COHb <2%) and after smoking (COHb:65%), and

22 non-smokers were studied. Maximal aerobic power and cardiopulmonary variables were measured during lower/upper body exercise using an automated exercise system. Maximal anaerobic power during lower/upper body exercise was evaluated using the Wingate test. Results and conclusions: The chronic I acute effects of light to moderate smoking does not appear to impact the aerobic/anaerobic capacity for lower/upper body exercise; female soldiers have a normal aerobic and anaerobic capacity for upper and lower body exercise with an average level of fitness; they appear to be equally fit for aerobic and anaerobic exercise; no correlation was observed between the APFT and indices of aerobic/anaerobic capacity; maximal aerobic capacity was 60% of men, 72% when normalized for body weight.

DTIC

Physical Exercise; Physical Fitness; Physiological Effects; Females

19980011685 Walter Reed Army Medical Center, Washington, DC USA

Pushup Performance by Women: Analysis of Modes of Failure Final Report, 1 Dec. 1994 - 30 Sep. 1995

Boyea, Steven R., Walter Reed Army Medical Center, USA; Oct. 1995; 11p; In English

Report No.(s): AD-A332965; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To analyze the modes of muscle failure during pushups in active duty women determining a single weak link in performance multiple modes of failure. 25 U.S. Army active duty women were prospectively studied. Each participated in eight sessions, separated by a minimum 48 hours, consisting of stretching warm ups then prefatigue of a specific muscle group to muscle failure with a predetermined exercise. The initial session set a baseline without prefatigue, the following sessions prefatigued the trapezius, latissimus dorsi, deltoid, pectorals, biceps, triceps, and abdominals. Studied 25 women, mean age of 33.5 yrs, 19 enlisted and 6 officers with a mean weight of 135.9 lbs. Baseline mean was 22 pushups. Prefatigue of pectorals gave a mean of 9 pushups, triceps mean 11 pushups, deltoid mean 15 pushups, abdominals mean 16 pushups, biceps mean 17 pushups, latissimus dorsi mean 17 pushups, and the trapezius mean 19 pushups. Prefatiguing of the pectorals and triceps give a significant decrease in pushups compared with other muscle groups.

DTIC

Physical Exercise; Females; Muscles

53

BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

19980009262 Institute for Human Factors TNO, Soesterberg, Netherlands

A Field Study on the Development of Team Training Systems Interim Report Een Veldstudie Naar de Ontwikkeling van Team Training

vanBerlo, M. P. W., Institute for Human Factors TNO, Netherlands; Sep. 16, 1997; 62p; In English

Contract(s)/Grant(s): B96-036

Report No.(s): TM-97-B017; TD97-0238; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

Despite the acknowledgment of the importance of team performance and team training, relatively few endeavours have been undertaken to train teams in a systematic way (excepting Crew Resource Management training). A possible explanation could be that there is no methodology to guide the instructional developers and trainers in designing, executing and evaluating team training systems. to ascertain which guidelines should be included in a methodology supporting the systematic development of team training systems, both a literature review and a field study have been conducted. In this report, the results of the field study will be discussed. After a brief introduction of the topic (chapter 1), in chapter 2 the framework of the field study is described. Twelve interviews were conducted with persons of the Royal Netherlands Air Force, the Royal Netherlands Navy, the Royal Netherlands Army, the Royal Military Police, and one civil organization. Information concerning team training simulators was obtained from an additional document study. In chapter 3 the results are presented, structured around the respective categories of questions: background information, organization and premises, analysis, design and execution, performance measurement and feedback, instructional methods and training devices, evaluation and maintenance, and concluding remarks. Based on the results, in chapter 4 the weak points in designing, executing and evaluating team training are discussed. Chapter 5 concludes with an overview of proposed further research.

Author

Training Simulators; Training Devices; Resources Management

19980009263 Institute for Human Factors TNO, Soesterberg, Netherlands

Effects of Fatigue and Social Environment on Performance: Individual and Team Tasks *Interim Report Effecten van Vermoeidheid en Sociale Omgeving op Prestatie: Individuele en Team Taken*

vanOrden, C. Y. D., Institute for Human Factors TNO, Netherlands; Gaillard, A. W. K., Institute for Human Factors TNO, Netherlands; Langefeld, J. J., Institute for Human Factors TNO, Netherlands; Jul. 07, 1997; 40p; In English

Contract(s)/Grant(s): B95-102

Report No.(s): TD97-0228; TM-97-B011; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

The current experiment is the fifth in a series of studies that investigate the effects of fatigue and social environment on task performance. The following topics were studied: (1) Which tasks are most vulnerable to fatigue? (2) to what extent can the presence of another person during task performance compensate fatigue effects? (3) to what extent can 'social loafing' be prevented by giving a group public feedback on all group members' individual performance? (4) Does feedback motivate even without a bonus? (5) Does the type of feedback (individual or group feedback) have to be adjusted to the type of task (individual or interdependent team task)? Subjects, divided into four-person groups, worked 20 hours continuously (five sessions of four hours each) on three individual tasks that differed in cognitive complexity (Reaction Time Task (RTT); Memory Search Task (MST); and Contaminant Monitoring Task (CMT), and on a team task (TANDEM). The individual tasks were carried out both alone and in presence of another subject. Half of the subjects got (public) feedback on all group members' individual scores, the other half only got a group score. The tasks differed in their sensitivity to fatigue. Performance on the two simplest tasks (RTT and MST) deteriorated most over night, compared with the more complex CMT and the team task. One should realise, however, that during the experiment a rather strong learning effect occurred on both the CMT and the team task. This learning effect might have interfered with the fatigue effects. Nevertheless, it can be concluded that cognitive complex, and therefore maybe also more interesting tasks, are less vulnerable to fatigue than simple tasks. In general, subjects performed better on the individual tasks when they worked in presence of another subjects, as compared to alone. This was especially the case in the last sessions. So, the more tired one is, the more one profits from working with someone else. Subjects who got feedback on their individual scores performed better than those who got group feedback. It seems that 'social loafing' indeed can be prevented by making all individual group members' scores public. A comparison with the previous experiment shows that the performance of subjects who get individual feedback is even better if they are promised a bonus. Providing individual feedback is thought not to be very effective when people work on interdependent team tasks, since in such tasks they can hardly influence their own individual performance. This hypothesis that individual feedback is only efficient with individual tasks and that group feedback is better with interdependent team tasks, unfortunately could not be tested in this experiment, because there was too little variance in the individual scores on the team task.

Author

Human Performance; Fatigue (Biology); Tasks

19980009625 Institute for Human Factors TNO, Soesterberg, Netherlands

Target Acquisition in Complex Scenes, Part A: Search and Conspicuity Models *Final Report, 15 Aug. 1995 - 14 Aug. 1996*

Toet, A., Institute for Human Factors TNO, Netherlands; Nov. 1996; 75p; In English

Contract(s)/Grant(s): F49620-95-I-0495

Report No.(s): AD-A332390; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A visual search and detection experiment is performed on a set of complex natural images with military vehicles as targets. The area under the resulting cumulative detection probability curve of each target is adopted as a characteristic measure for its visual distinctness. The visual distinctness rank order induced by this measure is adopted as the reference rank order. This study investigates the capability of several digital target distinctness metrics and the psychophysically determined target visual lobe (i.e., the minimal distance between target and eye-fixation at which the target is no longer distinguishable from its surroundings) to reproduce the above-mentioned reference rank order. The visual lobe indeed appears a useful predictor of human performance in a visual search and detection task. Models of the early human visual system, a normalized root-mean square metric, and the edge distance metric introduced in this report, all seem to induce a visual distinctness rank ordering that agrees with human visual perception. Metrics based (1) on first order statistics of the graylevel histogram, (2) on the intersection of (oriented) graylevel histograms of target and background, and (3) on a combination of area and edge contrast, all correlate poorly with human observer performance. The CAMAELEON model (based on histogram intersection) is also highly sensitivity to variations in the definition (size and shape) of the target and background masks. The Perceptual Distortion model induces a visual target distinctness rank ordering identical to the one resulting from human observer performance, and therefore shows the best overall performance of all models and metrics tested in this study.

DTIC

Target Acquisition; Military Vehicles

19980009762 Institute for Human Factors TNO, Soesterberg, Netherlands

Team Training versus Team Building and Cooperative Learning: Defining the Field of Research *Interim Report Team Training vs Team Building en Cooperatief Leren: Afbakening van het Onderzoeksterrein*

vanBerio, M. P., Institute for Human Factors TNO, Netherlands; Sep. 19, 1997; 23p; In Dutch

Report No.(s): AD-A332270; TNO-TM-97-B019; TDCK-TD-97-0240; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Training is one of the factors influencing the effectiveness of teams. The concept team training, however, is often confused with the concept team building. Although the ultimate goal of both team training and team building is the same, there are considerable differences between the two. Also, team training is wrongly conceived of as cooperative learning. Again, there are similarities, but distinctions as well. In this report the differences and similarities between team training on the one hand, and team building and cooperative learning on the other hand, are discussed, with the purpose to define as clearly as possible the research on team training design. The implications of this comparison, and the experiences acquired in the fields of team building and cooperative learning, for the research on a methodology for developing team training systems, are discussed.

DTIC

Education; Teams; Performance Tests

19980009813 Institute for Human Factors TNO, Soesterberg, Netherlands

Effects of Fatigue and Social Environment on Performance: Individual and Team Tasks

vanOrden, C. Y., Institute for Human Factors TNO, Netherlands; Gaillard, A. W., Institute for Human Factors TNO, Netherlands; Langefeld, J. J., Institute for Human Factors TNO, Netherlands; Jul. 07, 1997; 46p; In Dutch

Report No.(s): AD-A332384; TNO-TM-97-B011; TDCK-TD97-0228; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The current experiment is the fifth in a series of studies that investigate the effects of fatigue and social environment on task performance. The following topics were studied: (a) Which tasks are most vulnerable to fatigue? (b) to what extent can the presence of another person during task performance compensate fatigue effects? (c) to what extent can 'social loafing' be prevented by giving a group public feedback on all group members' individual performance? (d) Does feedback motivate even without a bonus? (e) Does the type of feedback (individual or group feedback) have to be adjusted to the type of task (individual or interdependent team task)? Subjects, divided into four-person groups, worked 20 hours continuously (five sessions of four hours each) on three individual tasks that differed in cognitive complexity (RTT: Reaction Time Task; MST: Memory Search Task; CMT: Contaminant Monitoring Task), and on a team task (TANDEM). The individual tasks were carried out both alone and in presence of another subject. Half of the subjects got (public) feedback on all group members' individual scores, the other half only got a group score. The tasks differed in their sensitivity to fatigue. Performance on the two simplest tasks (RTT and MST) deteriorated most over night, compared with the more complex CMT and the team task. One should realise, however, that during the experiment a rather strong learning effect occurred on both the CMT and the team task. This learning effect might have interfered with the fatigue effects. Nevertheless, it can be concluded that cognitive complex, and therefore maybe also more interesting tasks, are less vulnerable to fatigue than simple tasks. In general, subjects performed better on the individual tasks when they worked in presence of another subjects, as compared to alone. This was especially the case in the last sessions.

DTIC

Fatigue (Biology); Human Performance; Social Factors; Cognition; Tasks

19980009821 TRADOC Analysis Command, White Sands Missile Range, NM USA

Distance Learning Annotated Bibliography *Final Report, Feb. - May 1996*

Howard, Fay S., TRADOC Analysis Command, USA; Jun. 1997; 128p; In English

Report No.(s): AD-A330045; TRAC-WSMR-TR-97-015; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This study was conducted for the TRADOC Deputy Chief of Staff for Training. This report reviews relevant studies and articles on distance learning (DL) to support the implementers of the DL plan. The annotated bibliography contains summaries of 106 articles from military, industry, and universities. The main report divides the 106 articles into ten categories. The categories were selected based on interest expressed from the proponent and commonalities of the literature. The categories are evaluations of DL; guidelines for planning and implementing DL; computer based training, computer aided training, and computer mediated communication; video teletraining, videotapes, and interactive videodisk; professional education; student interaction with instructors other students, and technology; reviews of DL literature; descriptions of some specific DL programs; cost effectiveness and system costs; and miscellaneous. These principal results were summarized from the articles. All forms of DL are at least as effective as traditional instruction in most instances. Course development for DL could be costly but the number of people trained could recoup the costs quickly. Instructors for DL would at least initially need training in interaction skills, summary techniques,

oral communication skills, and DL equipment operation. Costs for both the technology and course conversions were high but higher enrollments over a period of time would offset the costs.

DTIC

Bibliographies; Computer Assisted Instruction

19980010018 Walter Reed Army Inst. of Research, Washington, DC USA

Assessment of the Impact of Pre-military and Military Trauma on the Physical and Psychological Well-Being of Female and Male Active Duty Soldiers *Final Report*

Knudson, Kathryn H., Walter Reed Army Inst. of Research, USA; Dec. 1996; 55p; In English

Report No.(s): AD-A330012; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This study surveyed over 1000 female and male active duty soldiers to assess the impact of pre-military and military trauma on their physical and psychological well-being. The survey contained pertinent demographic information and a series of well-established scales in order to determine the history of trauma and physical and psychological symptoms, to include Post-Traumatic Stress Disorder (PTSD). The analyses examined the relationships between trauma, social support/unit cohesion, health risks and a history of reported symptoms of PTSD and other psychological and physical problems. Recommendations are presented which may help to mitigate development of such problems.

DTIC

Psychological Factors; Signs and Symptoms; Surveys; Males; Females; Health

19980010107 NERAC, Inc., Tolland, CT USA

Random Dot Stereograms: Latest Citations from the INSPEC Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862347; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the perception of depth, motion, and direction using random dot patterns. Citations focus on visual perception of random dot stereograms and kinematograms, with an emphasis on visual neurophysiology, physiological models, and cellular biophysics. Computer simulation, stereo image processing, filtering and prediction theory, artificial intelligence and neural nets represent coverage. The citations also examine stereopsis, spatio-temporal analysis, and modeling of visual perception.

NTIS

Bibliographies; Space Perception; Visual Perception; Computerized Simulation; Statistical Distributions; Biophysics

19980010126 Institute for Human Factors TNO, Soesterberg, Netherlands

A Proposal for Research on a Methodology for Developing Team Training Systems *Interim Report*

Vannerio, M. P. W., Institute for Human Factors TNO, Netherlands; Sep. 19, 1997; 33p; In English

Report No.(s): AD-A332225; TM-97-B018; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Despite the acknowledgment of the importance of team performance and team training, relatively few endeavors have been undertaken to actually train teams in a systematic way. A possible explanation could be that there is not yet a methodology to guide the instructional developers and trainers in designing, executing, and evaluating team training systems. The research question to be answered in this study is which guidelines should be included in a methodology supporting the systematic development of team training systems. In order to give an answer to this question the following strategy is proposed: (1) conduct a literature study, (2) conduct a field study, (3) develop a prototype of the methodology, (4) conduct an expert evaluation, (5) test the prototype in various experiments, and (6) apply the methodology in real life cases. This strategy is discussed extensively. The results of the literature study and the field study are briefly reviewed.

DTIC

Training Devices; Human Performance; Education; Proposals; Teams

19980010617 Gallaudet Coll., Washington, DC USA

NASA's Technical Experience for Select Students Program *Final Report*

1997; 21p; In English

Contract(s)/Grant(s): NAG5-2943

Report No.(s): NASA/CR-97-206444; NAS 1.26:206444; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

To provide college students with disabilities majoring in technical fields a challenging career-oriented work experience which would lead to further employment at the Goddard Space Flight Center.

Author

Education; NASA Programs

19980010812 Colorado Univ., Dept. of Psychology, Boulder, CO USA

Models of Working Memory Final Report, Apr. - Sep.1997

Miyake, Akira, Colorado Univ., USA; Shah, Priti, Colorado Univ., USA; Nov. 28, 1997; 9p; In English

Contract(s)/Grant(s): N00014-97-I-0547

Report No.(s): AD-A331951; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Working memory is a basic cognitive mechanism (or set of mechanisms) that is responsible for keeping track of multiple task related goals and subgoals, or integrating multiple sources of information. As such, it is essential for any complex cognitive task, such as planning an airplane's route or learning new computer software. Understanding the mechanisms and structures underlying working memory is, hence, one of the most important scientific issues that need to be addressed to improve the efficiency and performance of individuals on such cognitive tasks in a technological setting. A good understanding of working memory should lead to effective practical applications, such as the design of better computer interfaces, and novel techniques for training new personnel on complex information processing tasks. The goal of the symposium was to promote a better understanding of the architecture and mechanisms that underlie working memory as well as the practical implications of these important issues. The symposium was specifically dedicated to detailed systematic comparisons of existing models and theories of working memory. Thus, we included several features that would facilitate active communication and collaborative problem solving among participants during the symposium. Specifically, we used an issue based approach to theory comparison, in which each participant addressed a common set of important theoretical questions that have been guiding the current research in the field.

DTIC

Memory; Models; Performance Tests

19980010834 Institute for Human Factors TNO, Soesterberg, Netherlands

A Field Study on the Development of Team Training Systems Een veldstudie naar de ontwikkeling van team training

vanBerlo, M. P., Institute for Human Factors TNO, Netherlands; Sep. 16, 1997; 68p; In dut

Report No.(s): AD-A332155; TNO-TM-97-B017; TDCK-TD-97-0238; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Despite the acknowledgment of the importance of team performance and team training, relatively few endeavors have been undertaken to train teams in a systematic way excepting Crew Resource Management training. A possible explanation could be that there is no methodology to guide the instructional developers and trainers in designing, executing and evaluating team training systems. To ascertain which guidelines should be included in a methodology supporting the systematic development of team training systems, both a literature review and a field study have been conducted. In this report, the results of the field study will be discussed. After a brief introduction of the topic chapter 1, in chapter 2 the framework of the field study is described. Twelve interviews were conducted with persons of the Royal Netherlands Air Force, the Royal Netherlands Navy, the Royal Netherlands Army, the Royal Military Police, and one civil organization. Information concerning team training simulators was obtained from an additional document study. In chapter 3 the results are presented, structured around the respective categories of questions: background information, organization and premises, analysis, design and execution, performance measurement and feedback, instructional methods and training devices, evaluation and maintenance, and concluding remarks. Based on the results, in chapter 4 the weak points in designing, executing and evaluating team training are discussed. Chapter 5 concludes with an overview of proposed further research.

DTIC

Armed Forces (USA); Resources Management

19980010973 Army Aeromedical Research Lab., Fort Rucker, AL USA

Assessment of Aircrew Stress Final Report

Katz, Lawrence C., Army Aeromedical Research Lab., USA; Oct. 1997; 53p; In e

Contract(s)/Grant(s): Proj. 3M1-62787-A-879

Report No.(s): AD-A331652; USAARL-RN-97-37; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A questionnaire was developed and administered to 21 aircrew members of a medical evacuation unit. Respondents were asked about the causes of stress in their lives, coping skills, belief systems, and stress symptoms. Scores on 21 scales within these 4 categories were quantified and analyzed using correlations and regression analysis, to reveal problem areas, strengths, and inter-

relationships. A stress profile was generated for this unit, indicating strengths in the areas of relationship stability and relational rewards, but pointing to work changes and ongoing work pressures as significant stressors. Crewmembers use active, flexible problem-solving to their benefit in coping with stressors, but fail to seek support from others and often attempt to control the uncontrollable. Respondents are optimistic with a healthy self-esteem, but avoid expressing their own thoughts and feelings and believe they are powerless to impact their own lives. A symptom model was generated, illustrating the connection between a perceived lack of work rewards and physical and behavioral symptoms and the connection between harboring resentments and behavioral and emotional symptoms, for this unit. In addition, a pessimistic outlook was found to be related to physical symptoms and relationship pressures were related to emotional symptoms. Recommendations focused on how this information might be used by the unit command to guide efforts in minimizing unnecessary stress and optimizing crewmembers' ability to cope. The study demonstrated the utility of this questionnaire for assessing unit-specific stress factors and guiding interventions.

DTIC

Flight Crews; Signs and Symptoms; Stress (Biology); Emotional Factors

54

MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing. For related information see also 16 Space Transportation.

19980009350 Institute for Human Factors TNO, Soesterberg, Netherlands

Interference Between 6 degrees of Freedom in a 3D Hand Controller *Interim Report Interferentie Tussen Vrijheidsgraden bij een 3D Stuurmiddel*

Korteling, J. E., Institute for Human Factors TNO, Netherlands; Oving, A., Institute for Human Factors TNO, Netherlands; vanEmmerik, M. L., Institute for Human Factors TNO, Netherlands; vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; Jul. 04, 1997; 36p; In English

Contract(s)/Grant(s): B97-031

Report No.(s): TD97-0227; TM-97-B010; Copyright; Avail: Issuing Activity (TNO Human Factors Research Inst., Kampweg 5, 3769 De Soesterberg, The Netherlands), Hardcopy, Microfiche

A six Degree of Freedom (DOF) hand controller is a device that can be used for the simultaneous control of multiple axes. These kinds of control tasks are common in areas such as teleoperation. Multi-axis control may be problematic as a consequence of interference i.e., the control of a certain DOF affected the simultaneous control of another. Irrespective whether the cause of this interference lies in the operator's motor system or in his information processing system, it can be detrimental to task performance. When input on one DOF always results in undesired input on another DOF, the nature of this interference is systematic (cross-talk). The magnitude of the interference is probably affected by the number of DOFs that has to be controlled simultaneously. This was investigated in an experiment in which a compensatory tracking task was performed. In this task one DOF of a cursor in a perspective display was disturbed (externally). Subjects had to compensate this disturbance using a 6-DOF hand controller. At the same time they had to minimize input on the other (irrelevant to tracking) DOFS. It was investigated whether there were differences between tracking performance between each separate degree of freedom (X, Y, Z, Roll, Pitch, or Yaw). Furthermore, the effect of additional (irrelevant) DOFs that had to be controlled simultaneously (0, 1, or 5), was examined. With regard to the irrelevant degrees of freedom, the steering error thus was completely caused by incorrect, accidental, steering inputs. Error on the relevant DOF was a sum of this incorrect steering input and the disturbance signal. Both these errors (expressed in RMS scores) can be used to indicate the extent to which degrees of freedom interfered with each other. In this experiment a relative RMS score was calculated by dividing the RMS score with the mean RMS error score from the 1-DOF condition (no irrelevant DOFs) that was used as a baseline condition. This way, it was possible to gain insight in the performance increment or decrement as a function of the number of DOFs that had to be controlled. Through determination of the correlations between each combination of two degrees of freedom the extent to which systematic interference occurred was investigated - The experimental results show that in the 1-DOF condition tracking error was largest on Z with regard to translations and on Pitch with regard to rotations. This can be related to the effectivity of the presentation of the z-axis (i.e., used depth cues and compression) in the used perspective display. Furthermore, performance on relevant as well as irrelevant DOFs decreased when the number of visible degrees of freedom that had to be controlled increased. These limitation are attributed to the limited information processing capacity of the human operator. In relation to the other DOFs, this performance decrement for Z was substantially larger whereas it was smaller for X. Again this may be related to the effectivity of presentation of the different axes on the display. A clear training effect diminished the effect of interference in the second block of trials. For each DOF in each condition this effect was of the same magnitude, Input on a relevant DOF and input on an irrelevant DOF were always significantly correlated. The amount of cross-talk between degrees

of freedom did not change with the number of DOFs that had to be controlled. For half the combinations cross-talk even remained the same in the conditions without any visual information on the irrelevant DOFs. Therefore, it seems that cross-talk mainly results from motor limitations of the operator. Increasing the amount of haptic information in the hand controller, probably will help the operator to distinguish the degrees of freedom more easily. This may result in a reduction of cross-talk and better control.

Author

Degrees of Freedom; Control Equipment; Human Performance; Root-Mean-Square Errors

19980010028 Office of the Under Secretary of Defense (Acquisitions), Washington, DC USA

Joint Modeling and Simulation System (JMASS), Joint Initial Requirements Document (JIRD)

Feb. 28, 1997; 18p; In English

Report No.(s): AD-A332061; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Joint Modeling and Simulation System (JMASS) requirements will evolve through multiple stages. The purpose of this document is to define the initial overall programmatic requirements, high level capabilities, operation and support requirements for JMASS. Pilot projects will be used to refine and further specify the requirements in this document. Implementation of the specific requirements will be accomplished by a Program Office. JMASS is designed to support acquisition as defined in the Department of Defense (DoD) Regulation 5000.2-R. JMASS provides a software architecture for the development of models, configuration of models into simulations, execution of simulations, and post processing of data obtained from the simulation. The JMASS software facilitates interoperability with other simulations in accordance with DoD accepted standards. Additionally, it defines and implements a set of standards and documentation for JMASS compliant models. It provides tools that assist in the development and application of reusable models and model components. Standards defined and implemented by JMASS shall include: (1) Guidelines for the development of JMASS compliant models and documentation. These guidelines are called the Software Structural Model (SSM); (2) Tools to implement the SSM; (3) Model-to-model and model-to-system interfaces; (4) Tool-to-system interfaces; (5) Guidelines and tools for porting legacy models to JMASS; and (6) Man machine interface modeling.

DTIC

Software Engineering; Computerized Simulation; Defense Program; Government Procurement; Architecture (Computers)

19980010173 National Academy of Sciences - National Research Council, Committee on Military Nutrition Research, Washington, DC USA

Emerging Technologies for Nutrition Research: Potential for Assessing Military Performance Capability

Carlson-Newberry, Sydne J., National Academy of Sciences - National Research Council, USA; Costello, Rebecca B., National Academy of Sciences - National Research Council, USA; Jan. 1997; 714p; In English

Contract(s)/Grant(s): DAMD17-94-J-4046

Report No.(s): AD-A329691; No Copyright; Avail: CASI; A99, Hardcopy; A06, Microfiche

This publication, Emerging Technologies for Nutrition Research: Potential for Assessing Military Performance Capability, is the latest in a series of reports based on workshops sponsored by the Committee on Military Nutrition Research (CMNR) of the Food and Nutrition Board (FNB), Institute of Medicine, National Academy of Sciences. Other workshops or symposia have included such topics as food components to enhance performance; nutritional needs in hot, cold, and high-altitude environments; body composition and physical performance; nutrition and physical performance; cognitive testing methodology; and fluid replacement and heat stress. These workshops form part of the response that the CMNR provides to the Commander, U.S. Army Medical Research and Materiel Command, regarding issues brought to the committee through the Military Nutrition Division (currently the Military Nutrition and Biochemical Division) of the U.S. Army Research Institute of Environmental Medicine (USARIEM) at Natick, Massachusetts.

DTIC

Medical Science; Military Technology; Research and Development

19980010931 Army Aeromedical Research Lab., Fort Rucker, AL USA

Evaluation of the Communications Earplug in the H-53 and CH-46 Helicopter Environments Final Report

Mozo, Ben T., Army Aeromedical Research Lab., USA; Murphy, Barbara A., Army Aeromedical Research Lab., USA; Sep. 1997; 24p; In English

Report No.(s): AD-A331662; USAARL-97-36; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Noise levels inside military helicopters generally exceed noise exposure limits established by DOD Instruction 6055.12, 'Hearing conservation' (1991). Noise levels in helicopters with higher load capacities such as the CH-47, CH-46, and H-53 are extremely high and sometimes exceed the helmet's capability to provide adequate hearing protection for crewmembers. Noise compromises communication because of inadequate speech signal to noise ratio at the ear (Mozo, Murphy, and Ribera, 1995; Rib-

era et al., 1996; Mozo and Murphy, 1997; and Staton, Mozo, and Murphy, 1997). Use of combination protection, earplug in addition to the helmet, does provide the necessary hearing protection, but further compounds the problems associated with communications capability. While active noise reduction (ANR) provides exceptional low frequency hearing protection, it does little or nothing to improve protection for frequencies above 800 hertz. A U.S. Army Aeromedical Research Laboratory (USAARL) report (Mozo and Murphy, 1997) shows ANR does improve speech intelligibility when worn alone, but both hearing protection and speech intelligibility are degraded when worn with ancillary equipment such as spectacles and chemical biological (CB) mask. Aircraft modification, system cost, lateral impact, weight, and others factors should be evaluated carefully when considering the use of ANR in the helicopter environment. The communications earplug (CEP) shown in the figure is a device which incorporates a miniature earphone with foam earplug and can be worn in combination with the aviator's helmet. Calculations show the CEP provides adequate hearing protection for 8 hours duty even in the high noise levels found in the H-53. The device also provides voice communication intelligibility which approaches asymptotic limits near 100 percent in those high noise environments. The system is lightweight, cost effective, and does not require modification of the aircraft wiring.

DTIC

Ear Protectors; Evaluation; Noise Intensity; Radio Communication; Telecommunication

19980010991 Institute for Human Factors TNO, Soesterberg, Netherlands

Interference Between 6 Degrees of Freedom in a 3D Hand Controller

Korteling, J. E., Institute for Human Factors TNO, Netherlands; Oving, A., Institute for Human Factors TNO, Netherlands; vanEmmerik, M. L., Institute for Human Factors TNO, Netherlands; vanErp, J. B. F., Institute for Human Factors TNO, Netherlands; Jul. 04, 1997; 41p; In English

Report No.(s): AD-A332586; TNO-TM-97-B010; TDCK-TD97-0227; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A six degree of freedom (DOF) hand controller is a device that can be used for the simultaneous control of multiple axes. These kinds of control tasks are common in areas such as teleoperation. Multi-axis control may be problematic as a consequence of interference i.e., the control of a certain DOF affected the simultaneous control of another. Irrespective whether the cause of this interference lies in the operator's motor system or in his information processing system, it can be detrimental to task performance. When input on one DOF always results in undesired input on another DOF, the nature of this interference is systematic (cross-talk). The magnitude of the interference is probably affected by the number of DOFs that has to be controlled simultaneously. This was investigated in an experiment in which a compensatory tracking task was performed. In this task one DOF of a cursor in a perspective display was disturbed (externally). Subjects had to compensate this disturbance using a 6-DOF hand controller. At the same time they had to minimize input on the other (irrelevant to tracking) DOFs. It was investigated whether there were differences between tracking performance between each separate degree of freedom (X, Y, Z, Roll, Pitch, or Yaw). Furthermore, the effect of additional (irrelevant) DOFs that had to be controlled simultaneously (0, 1, or 5), was examined. With regard to the irrelevant degrees of freedom, the steering error thus was completely caused by incorrect, accidental, steering inputs. Error on the relevant DOF was a sum of this incorrect steering input and the disturbance signal. Both these errors (expressed in RMS scores) can be used to indicate the extent to which degrees of freedom interfered with each other.

DTIC

Degrees of Freedom; Controllers; Manual Control

19980011664 Army Aeromedical Research Lab., Fort Rucker, AL USA

Development of a Standard for the Health Hazard Assessment of Mechanical Shock and Repeated Impact in Army Vehicles. Phase 4--Experimental Phase Final Report

Cameron, Barbara, Army Aeromedical Research Lab., USA; Morrison, James, Army Aeromedical Research Lab., USA; Robinson, Dan, Army Aeromedical Research Lab., USA; Vukusic, Alen, Army Aeromedical Research Lab., USA; Martin, Steven, Army Aeromedical Research Lab., USA; Jan. 1996; 328p; In English

Contract(s)/Grant(s): Proj. 3O1-62787-A878

Report No.(s): AD-A332813; No Copyright; Avail: CASI; A15, Hardcopy; A03, Microfiche

Military Significance: New tactical ground vehicles developed by the U.S. Army are lower in weight and capable of higher speeds than their predecessors. This combination produces repetitive mechanical shocks that are transmitted to the soldier primarily through the seating system. Under certain operating conditions, this exposure poses health and safety threats to the crew as well as performance degradation due to fatigue. The Army Surgeon General urgently required the Medical Research and Materiel

Command to develop exposure standards for repetitive impacts that are relevant to the environment of soldiers operating modern tactical vehicles.

DTIC

Mechanical Shock; Medical Science; Surgeons; Health

19980011992 General Accounting Office, Washington, DC USA

Human Factors: FAA's Guidance and Oversight of Pilot Crew Resource Management Training Can Be Improved

Nov. 1997; 27p; In English

Report No.(s): AD-A332641; GAO/RCED-98-7; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Airline travel is one of the safest modes of public transportation in the USA. The current level of airline safety has been achieved, in part, because the airline industry and government regulatory agencies have implemented rigorous pilot training and evaluation programs. The major airlines have training programs for pilots that focus on, among other things, maintaining flying skills, qualifying to fly new types of aircraft, and acquiring skills in dealing with emergencies. FAA'S original regulations for the airlines' general training programs-referred to in this report as part 121-sell out the number of hours of training required in particular areas, such as the time spent practicing emergency procedures. Effective for 1996, FAA instituted a requirement for CRM training under part 121 that states the following: 'After March 19, 1998, no certificate holder AIRLINE may use a person as a flight crewmember, and after March 19, 1999, no certificate holder may use a person as a flight attendant or aircraft dispatcher unless that person has completed approved crew resource management or dispatcher resource management initial training, as applicable, with that certificate holder or with another certificate holder.' FAA believes that this training should improve flight crews' performance.

DTIC

Aircraft Safety; Airline Operations; Commercial Aircraft; Flight Crews; Human Factors Engineering; Pilot Training; Civil Aviation

59

MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

19980009083 INTEL Corp., Supercomputer Systems Div., Beaverton, OR USA

Proceedings of the 1991 Annual Users' Conference

Nov. 1991; 510p; In English; 1991 Annual User's Conference, 6-9 Oct. 1991, Dallas, TX, USA; Also announced as 19980009084 through 19980009106; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

This proceedings document is being published to promote the exchange of information among Intel Supercomputer Users' Group Members. Contained herein are abstracts and/or copies of the presentations and papers presented by users at the 1991 Annual Users' Conference in Dallas, Texas. It is hoped that the information contained in these proceedings will be of use to you, as an Intel supercomputer user, and will encourage you to participate in and benefit from Users' Group membership.

Author

Supercomputers; Hypercube Multiprocessors; Multiprocessing (Computers); Parallel Processing (Computers); Poisson Density Functions; Iterative Solution

60

COMPUTER OPERATIONS AND HARDWARE

Includes hardware for computer graphics, firmware, and data processing. For components see 33 Electronics and Electrical Engineering.

19980009241 NERAC, Inc., Tolland, CT USA

Motorola 68000 16-Bit Microprocessors (Latest Citations from the INSPEC Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869649; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the 68000 family of Motorola 16-bit microprocessors developed in 1982. The 68000 has become popular in consumer products and in industrial applications. Microcomputers that incorporate the 68000 are

included in the citations. Also included are software designs for different operating systems, such as UNIX, Ada, and Apple's DOS, run on the 68000. References to the 32-bit 68020 are excluded, but are covered in a separate bibliography. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Microprocessors

19980009804 NERAC, Inc., Tolland, CT USA

Vector Processing and Processors. (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866876; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning development and evaluation of high speed and high performance vector processing and processors. Topics include computer architecture, vector computers, vector algorithms, Monte Carlo techniques, and Cray processors. Applications in high speed scientific computations, vectorization of nuclear codes, and aerodynamic flow analysis are discussed.

NTIS

Aerodynamic Characteristics; Architecture (Computers); Cray Computers; High Speed; Monte Carlo Method; Vector Processing (Computers)

19980010108 NERAC, Inc., Tolland, CT USA

Redundant Array of Inexpensive Disks (RAID): Latest Citations from the Microcomputer Abstracts Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862636; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the basic features and key parameters of RAID systems. The RAID technology is compared with other mass storage technologies such as magnetic tape and optical systems, including WORM and magneto-optic. The advantages of a robust, fault-tolerant RAID storage system in a computer server configuration are discussed, particularly in disaster recovery modes. Key parameters such as transfer/access time, data transfer rates, and power requirements are described. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Architecture (Computers); Computer Design

19980010443 NERAC, Inc., Tolland, CT USA

Digital Signal Processors: Latest Citations from the US Patent Bibliographic File with Exemplary Claims

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863097; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design, development, and architecture of digital signal processors (DSPs). Citations describe real time, concurrent, multifunction, programmable, and synchronous DSP systems. Topics include digital coding, digital filters, memory devices, signal compression and conversion, processor interface and control, shift and add, and array multipliers. Applications in radars, computer systems, personal computers, radio base stations, data acquisition systems, and electrical signal processing are covered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Central Processing Units; Signal Processing; Digital Systems

19980010837 Accurate Automation Corp., Chattanooga, TN USA

High Fidelity Modeling and Imaging for Tactical and Strategic Applications Monthly Report, 1-31 Oct. 1997

Akita, Richard, Accurate Automation Corp., USA; Oct. 31, 1997; 5p; In English

Contract(s)/Grant(s): N00014-96-C-2131

Report No.(s): AD-A332320; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

AAC has commenced work with funds provided in October on tasks E.1 'Improved SSGM,' E.1.1 'Add New Modules,' E.1.3 'Expand SSGM Databases,' and E.2 'Develop System Architecture.' Attachment 1 contains the tasks that support the above paragraphs of the SOW. Funding for this project was received in October 1997. Due to lack of funds from July through September 1997, no work was performed during that period. It is to be noted that the efforts in tasks 1.4, 1.5, and 1.8 will directly lead to com-

mercializing the SSGM technology. high-accuracy SSGM databases can be used with PC workstations or laptop computers with a modest amount of memory in graphical information services. Civilian applications include: 1. Mapping of the rain forests for early detection of illegally set fires. 2. Two-and three-dimensional images and maps of remote areas for planning of fire fighting and rescue operations. B. SUMMARY OF PROBLEMS OR CONCERNS We are expecting additional funds from NRaD to restart the Real Time Retargeting efforts. NRaD has informed AAC that they expect funds early this fiscal year. Funding provided will only partially support the tasks in attachment 1.

DTIC

Warfare; Models; Imaging Techniques; Tactics; Decision Support Systems

19980010886 NERAC, Inc., Tolland, CT USA

Multilevel Security: Computers and Data Networks. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English

Report No.(s): PB96-866124; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the protection of information within a computer or network in a multi-user environment. The security system protects information of differing classifications when used by personnel with different clearances. Access is controlled to the computer and to information levels within the computer. The security system works with both trusted and not trusted computers in a network.

NTIS

Computer Networks; Computers; Protection; Security; Warning Systems; Clearances

61

COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, algorithms, and specific applications, e.g., CAD/CAM.

19980009085 Texas Univ., Div. of Mathematics and Computer Science, San Antonio, TX USA

Synchronous and Asynchronous Computing on the Intel iPSC/860 Multicomputer

Grossenbacher, Edmund, Texas Univ., USA; Zhang, Xiao-Dong, Texas Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 33-39; In English; Also announced as 19980009083

Contract(s)/Grant(s): NSF CCR-91-02854; NSF CCR-90-08991; SAAF-1880-012; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

A group of parallel methods and their implementations are discussed for solving sparse nonlinear systems of equations. Our approach is to transform sparse nonlinear systems of equations into special structures so that the computations can be efficiently decomposed for parallel processing. Duff has suggested that row and column interchanges be applied to permute the coefficient matrix of a linear system into block lower triangular form. Based on this approach, we directly transform a sparse nonlinear system into a nonlinear lower block triangular form. Several variations of the methods in asynchronous form to improve parallel efficiency are described. These asynchronous methods overlap the communication and the computation, and significantly increase the efficiency of the computation. Experimental results on the Intel iPSC/860, a distributed memory multicomputer, are presented to show the effectiveness of these methods. These experiments include a large nonlinear system modeling chemical processes in an oil refinery simulation.

Author

Distributed Memory; Linear Systems; Matrices (Mathematics); Multiprocessing (Computers); Nonlinear Systems; Parallel Processing (Computers)

19980009093 INTEL Corp., Supercomputer Systems Div., Beaverton, OR USA

The ProSolver Applications Software: Large Scale Solvers for the Intel Supercomputers

Barton, Michael L., INTEL Corp., USA; Castro-Leon, Enrique, INTEL Corp., USA; Kushner, E., INTEL Corp., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 209-218; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

A direct equation solver that addresses very large (out-of-core), positive definite, linear systems has been developed for the iPSC/860. This solver is applicable when the coefficient matrix is either full populated or skyline-formatted. Separate routines exist to support applications that create symmetric or non-symmetric coefficient matrices by value. High performance has been achieved through the use of a dot product routine coded in i860 assembly language. In addition, disk I/O has been optimized to

ensure performance on very large applications. Results will be presented to indicate performance on very large applications. Results will be presented to indicate performance for two applications, one of which arises from the finite element method.

Author

Applications Programs (Computers); Assembly Language; Finite Element Method; Linear Systems; Supercomputers

19980009100 San Diego Supercomputer Center, San Diego, CA USA

A Batch Scheduler for the iPSC/860 Machine

Wan, Michael, San Diego Supercomputer Center, USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 321-341; In English; Also announced as 19980009083

Contract(s)/Grant(s): NSF ASC-90-13995; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Release 3.3 of the iPSC System Software which is currently running on our iPSC system supports a minimal implementation of NQS, the Network Queueing System. It provides the ability to define prioritized batch queues on the SRM. An extension to NQS has been made by SDSC (San Diego Supercomputer Center) to allow specific cube sizes and time limits to be associated with batch queues, and includes a scheduler which initiates jobs, enforces time limits, and provides priority aging for queued jobs. The NQS scheduler divides the day into Prime and Non-prime hours. In addition, the cube is divided into two partitions, interactive and batch. The cube partition may be configured differently during Prime and Non-prime hours which provides administrators the flexibility of configuring a relatively large number of nodes for interactive use during Prime hours while devoting most of the nodes to batch jobs during Non-prime hours. The NQS scheduler schedules jobs and enforces time limits in the batch partition. It uses different scheduling strategies during each period. Prime-time scheduling is strictly based on priority, whereas Nonprime scheduling attempts to minimize idle nodes while still providing good turnaround time for high priority jobs. The scheduling scheme also allows users to schedule nodes for interactive use based on a 'tennis court' type scheduling scheme. A 'clrcube' command is provided to allow scheduled interactive users to kill off unscheduled users' interactive jobs. This is a software development project done by SDSC for the SSD division of Intel. The software is being beta tested at NASA Langley, NASA Ames and SDSC.

Author

Computer Programming; Queueing Theory; Software Engineering; Supercomputers; Tasks

19980009101 Vanderbilt Univ., Computer Science Dept., Nashville, TN USA

A Hypercube Implementation of Davidson's Algorithm for the Large, Sparse, Symmetric Eigenvalue Problem

Stathopoulos, Andreas, Vanderbilt Univ., USA; Fischer, Charlotte Froese, Vanderbilt Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 343-353; In English; Also announced as 19980009083

Contract(s)/Grant(s): NSF ASC-90-05687; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Many scientific applications, require a few of the extreme eigenvalues and eigenvectors of a large, sparse, symmetric matrix. In quantum chemistry calculations, Davidson's algorithm is often used where matrices of size 10^6 are no longer unusual. On serial computers, the matrix elements were stored on disk and a rapidly convergent method was needed that relied only on matrix-vector multiplication. In atomic physics applications, problems are several orders of magnitude smaller and the matrices can be stored in sparse form in memory. We will report on an implementation of Davidson's algorithm for a hypercube where the matrix elements are distributed over the nodes of the system. The size of the problem that can then be solved will increase with the number of nodes. Davidson's algorithm is an iterative method based on the principle of approximating the eigenvectors by linear combinations of the vectors from a small subspace of $R(n)$. Since the lowest eigenvalue, for example, can be shown to satisfy a minimum principle, the problem can be reduced to finding the minimum value within the subspace. The latter is a small eigenvalue problem. If the resulting approximation is not satisfactory, the approximate vector may be used to derive a new basis vector expanding the size of the subspace. Clearly as the size of the subspace grows, the accuracy of the approximation increases. The most time consuming step of this algorithm is the generation of the small eigenvalue-problem, whose entries are obtained by multiplying the original matrix with the basis vectors. This is the only step where the large matrix is required. Since the matrix is sparse, large and symmetric, only the non-zero elements of the lower triangular part, are kept. A special data structure was designed for each node.

Author

Data Structures; Hypercube Multiprocessors; Matrices (Mathematics); Multiplication; Quantum Chemistry; Vectors (Mathematics)

19980009102 NASA Lewis Research Center, Cleveland, OH USA

A Computational Grid Oriented Data Base

Ecer, Akin, Purdue Univ., USA; Blech, Richard, NASA Lewis Research Center, USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 355; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006); Abstract Only, Hardcopy, Microfiche

Parallel computation of large problems in fluid dynamics and structural mechanics problems involve a computational grid. One way of utilizing parallel computers for solving such large problems, is to run the same computer code on different nodes of a machine for different regions of the grid. The objective of the present study is to enable the utilization of a computer code which was developed on a single machine to be used in such a fashion. A data base is defined for describing grid based data on parallel machines. Communication between the nodes are performed intern of data base routines and standard communication tools.

Author

Computational Grids; Computer Programs; Parallel Computers

19980009104 Rice Univ., Houston, TX USA

An Overview of the FORTRAN D Programming System

Koelbel, Charles, Rice Univ., USA; vonHanxleden, Reinhard, Rice Univ., USA; Hiranandani, Seema, Rice Univ., USA; Kennedy, Ken, Rice Univ., USA; Kremer, Uli, Rice Univ., USA; Liebrock, Lorie, Rice Univ., USA; Roth, Jerry, Rice Univ., USA; Tseng, Chau-Wen, Rice Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 385-403; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Parallel computing is being hampered by a software crisis. Parallel programs are difficult to write (because new languages must be learned), difficult to debug (because of nondeterminism), and difficult to port to new architectures (because each machine has its own language). Our group at Rice, in cooperation with several other universities, is attempting to lessen these problems with a set of extensions called FORTRAN D. This talk will describe the FORTRAN D extensions themselves, give an overview of our compiler strategy, and give glimpses of several other related projects.

Author

Computer Programming; Parallel Processing (Computers); Interprocessor Communication; Massively Parallel Processors; MIMD (Computers); Supercomputers

19980009134 Oak Ridge Y-12 Plant, TN USA

Advanced software algorithms

Berry, K., Oak Ridge Y-12 Plant, USA; Dayton, S., Oak Ridge Y-12 Plant, USA; Oct. 28, 1996; 6p; In English

Contract(s)/Grant(s): DE-AC05-84OS-21400

Report No.(s): Y/AMT-458; DE97-008829; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Citibank was using a data collection system to create a one-time-only mailing history on prospective credit card customers that was becoming dated in its time to market requirements and as such was in need of performance improvements. to compound problems with their existing system, the assurance of the quality of the data matching process was manpower intensive and needed to be automated. Analysis, design, and prototyping capabilities involving information technology were areas of expertise provided by DOE-LMES Data Systems Research and Development (DSRD) program. The goal of this project was for Data Systems Research and Development (DSRD) to analyze the current Citibank credit card offering system and suggest and prototype technology improvements that would result in faster processing with quality as good as the current system. Technologies investigated include: a high-speed network of reduced instruction set computing (RISC) processors for loosely coupled parallel processing, tightly coupled, high performance parallel processing, higher order computer languages such as 'C', fuzzy matching algorithms applied to very large data files, relational database management system, and advanced programming techniques.

DOE

Data Management; Data Base Management Systems; Finance; Data Systems

19980009232 NERAC, Inc., Tolland, CT USA

Electronic Circuit Simulation Computer Program: SPICE. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866496; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning SPICE, a computer program for modeling or simulation of electronic circuit boards. Numerous models of different semiconductors are presented. Some improvements and program interfaces are discussed which expand the capabilities of the original program to include interactive graphics and very specific semiconductor analysis. A second generation of SPICE, SPICE2, is also reviewed in this bibliography.

NTIS

Bibliographies; Integrated Circuits; Circuit Boards; Simulation

19980009243 NERAC, Inc., Tolland, CT USA

Object-Oriented Systems (Latest Citations from the US Patent Bibliographic File with Exemplary Claims)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869581; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning object-oriented software, databases, and operating systems. Objects are treated as logic terms in logic language systems, and logic terms as objects in object-oriented language systems. References cover client-server systems, user authentication, dynamic object messaging, monitoring/control systems, file systems, class library, and network interfacing. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Object-Oriented Programming; Bibliographies; Operating Systems (Computers); Data Bases

19980009265 National Inst. of Standards and Technology, Gaithersburg, MD USA

RISQ: A Web-Based Tool for Referencing Information on Software Quality

Weinstock, C. B., Carnegie-Mellon Univ., USA; Wallace, D. R., National Inst. of Standards and Technology, USA; Jan. 1997; 29p; In English

Report No.(s): PB97-140578; NISTIR-5954; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

World Wide Web (WWW) technology has provided access to enormous amounts of information on-line. As such, it has a tremendous potential for use as an aid to technology transfer. However, locating relevant information is often difficult partially because of the volume of information available. This report describes a new search engine which is designed to allow the user to do efficient searches for information within a specific domain of high integrity software systems and is called RISQ for 'Reference Information for Software Quality.' The search engine allows searches by taxonomy based keywords, other keywords, and artifact type. Artifacts can range from simple abstracts, documents and software to video, audio and on-line interactive demonstrations of software tools. This report discusses the philosophy of the system, the acceptance criteria for artifacts, and provides instructions for using the RISQ.

NTIS

World Wide Web; Technology Transfer; Taxonomy; On-Line Systems

19980009285 National Inst. of Standards and Technology, Gaithersburg, MD USA

Computer Integrated Knowledge Systems (CIKS) for Construction Materials, Components, and Systems: Proposed Framework

Kurihara, T. Y., National Inst. of Standards and Technology, USA; Kaetzel, L. J., National Inst. of Standards and Technology, USA; Sep. 1997; 52p; In English

Report No.(s): PB97-210751; NISTIR-6071; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Developing a proposed framework for a Computer Integrated Knowledge System (CIKS) for construction materials, components and systems, requires a practical approach in order to be utilized by the building materials industry. The need for practicality has driven the design of the framework to include many commercial technologies, as well as research results where feasible. The report presents the framework from the external, management, and operational views, followed by a conceptual representation discussion in Appendix A. The external view includes the partners, user interface, and network. The management view addresses the application, data, and knowledge management. These views are followed by an operational view, which includes a pilot system, menu of options, and development phases, which outlines the steps for building an example of the framework. Finally, Appendix B contains a discussion on the CIKS coating partnership for highway structures.

NTIS

Computer Programming; Expert Systems; Data Management; Information Systems; Construction Materials

19980009321 Massachusetts Inst. of Tech., Dept. of Aeronautics and Astronautics, Cambridge, MA USA

A Geometry Based Infra-structure for Computational Analysis and Design

Haimes, Robert, Massachusetts Inst. of Tech., USA; [1997]; 60p; In English

Contract(s)/Grant(s): NAG3-2019

Report No.(s): NASA/CR-97-206713; NAS 1.26:206713; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The computational steps traditionally taken for most engineering analysis (CFD, structural analysis, and etc.) are: Surface Generation - usually by employing a CAD system; Grid Generation - preparing the volume for the simulation; Flow Solver - producing the results at the specified operational point; and Post-processing Visualization - interactively attempting to understand the results. For structural analysis, integrated systems can be obtained from a number of commercial vendors. For CFD, these steps have worked well in the past for simple steady-state simulations at the expense of much user interaction. The data was transmitted between phases via files. Specifically the problems with this procedure are: (1) File based. Information flows from one step to the next via data files with formats specified for that procedure. (2) 'Good' Geometry. A bottleneck in getting results from a solver is the construction of proper geometry to be fed to the grid generator. With 'good' geometry a grid can be constructed in tens of minutes (even with a complex configuration) using unstructured techniques. (3) One-Way communication. All information travels on from one phase to the next. Until this process can be automated, more complex problems such as multi-disciplinary analysis or using the above procedure for design becomes prohibitive.

Derived from text

Computer Aided Design; Computational Grids; Geometry; Design Analysis

19980009324 NERAC, Inc., Tolland, CT USA

Intelligent Agents. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-858006; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the theory and usage of software intelligent agents. Models, simulations, and architecture of intelligent agents are described. Applications of intelligent agents in various industries such as telecommunications and manufacturing are included.

NTIS

Bibliographies; Programming Languages; Computer Programs; Simulation; Architecture (Computers)

19980009500 NERAC, Inc., Tolland, CT USA

APL Programming Language: Mathematics and Arrays. (Latest citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-868310; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning applications of APL (A Programming Language) in mathematics and arrays. Citations examine industrial statistical analyses, Markov processes, game theory in management, microcomputer applications, actuarial applications, and numerical analysis. Topics also include APL codes and compilations. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; APL (Programming Language)

19980009627 Nebraska Univ., Dept. of Computer Science and Engineering, Lincoln, NE USA

Algebraic and Geometric Methods in Signal Processing Computer Vision and Automatic Target Recognition Final Report, 1 Nov. 1993 - 30 May 1997

Bhattacharya, Prabir, Nebraska Univ., USA; Aug. 12, 1997; 11p; In English

Contract(s)/Grant(s): F49620-94-I-0029

Report No.(s): AD-A332351; AFOSR-TR-97-0664; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have developed a method for the analysis and interpretation of gray images using a new definition of connected components that is dependent on two parameters. We considered the topological properties of gray images on an arbitrary grid. We presented an algorithm for the matching of space curves. We developed a method of object recognition by computing the invariants

of conics. We developed an intelligent product selection method, using fuzzy logic. Finally we investigated a hierarchical prioritization scheme for a family of belief structures where we may dynamically adjust the priorities.

DTIC

Target Recognition; Image Processing; Pattern Recognition

19980009794 Rochester Univ., Dept. of Computer Science, NY USA

TRAINS-1996 System Evaluation

Stent, Amanda J., Rochester Univ., USA; Allen, James F., Rochester Univ., USA; Mar. 19, 1997; 42p; In English

Contract(s)/Grant(s): N00014-95-1-1088; NSF IRI-96-23665

Report No.(s): AD-A329865; TRAINS-TN-97-1; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In this report we describe an experiment designed to: (1) evaluate the performance of the TRAINS-96 system as a whole; (2) examine the utility of a new robust post-parser module, recently added to the TRAINS system, and (3) explore the benefit to the user of receiving system feedback on speech input. The evaluation uses the same task-based methodology as was used for the TRAINS-95 evaluation, in which the user and computer cooperatively solve a given problem. Success is measured in terms of task performance measures such as time to completion of a task, and the quality of the final plan produced.

DTIC

Speech Recognition; Artificial Intelligence; Experiment Design; Evaluation; Human-Computer Interface; Human Performance

19980009798 Technische Univ., Eindhoven, Netherlands

Parallel Algorithms for Parameter Identification in Odes

Matheij, R. M. M., Technische Univ., Netherlands; Wright, S. J., Technische Univ., Netherlands; Dec. 1996; 25p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-204960; RANA-96-27; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We discuss the solution of parametrized linear difference equations subject to (possibly overdetermined) side conditions. by viewing the problem as a structured quadratic program and using techniques from matrix perturbation theory, we discuss well conditioning of the problem and its consequences for the distribution of the side conditions and parameter coefficients. An efficient, stable, and parallel algorithm is described, together with computational results on current multiprocessor computer architectures.

NTIS

Architecture (Computers); Difference Equations; Linear Equations; Perturbation Theory; Parameter Identification; Coefficients; Algorithms

19980009806 Cornell Univ., New York, NY USA

Fault-Tolerant and Real-Time Distributed Computing Final Report, 1 May 1994 - 30 Sep. 1996

Schneider, Fred B., Cornell Univ., USA; Nov. 23, 1993; 5p; In English

Contract(s)/Grant(s): F49620-94-I-0198

Report No.(s): AD-A332106; AFOSR-TR-97-0661; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Progress was made on a number of problems in the areas of fault-tolerant and real-time computing. Programming logics were investigated for reasoning about distributed programs that must satisfy real-time constraints, must interact with a continuous physical environment, and whose correctness depends on properties of schedulers and degree of resource Contention. A new approach to fault tolerance, based on a virtual machine monitor was developed. It provides fault-tolerance without requiring modifications to hardware or software. Finally, software to support mobile network agents was developed and released. Algorithms to implement agent fault-tolerance were developed

DTIC

Real Time Operation; Fault Tolerance; Distributed Processing

19980009812 Oxford Univ., Computing Lab., Oxford, UK

Optimal Program Scheduling on Parallel and Distributed Systems Final Report

Mccoll, W. F., Oxford Univ., UK; Oct. 1997; 6p; In English

Contract(s)/Grant(s): N68171-96-C-9110; WK2QW6C-8076-EE01

Report No.(s): AD-A332098; OPSPDS-TR-7-97; R/D-8076-EE-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The Department of Defense High Performance Computing Modernization Program (HPCMP) 1 aims to establish a world-class, nationwide, integrated infrastructure to support the high-performance computational needs of the defense community for

research, development, testing, and evaluation. The HPCMP has established four Major Shared Resource Centers (MSRCs) to coordinate and lead this effort: ARL, CEWES, NAVO and ASC. The Defense Department's high performance computing facilities will be supporting roughly 4,000 scientists and engineers at over 100 defense laboratories, test centers, universities, and industrial sites across the nation. In addition, the MSRCs are establishing collaborative partnerships with several civilian high-performance computing centers in order to draw needed civilian expertise into the DoD. The application areas which will be pursued by this huge community is very broad.

DTIC

Defense Program; Parallel Processing (Computers); Distributed Processing

19980009833 NERAC, Inc., Tolland, CT USA

Adaptive Algorithms. (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866629; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development, implementation, and applications of adaptive algorithms. Various types of algorithms for adaptive control systems are discussed, including least mean square, recursive, constant modulus, fast, efficient, and iterative. Citations also discuss applications in signal processing, digital filtering, medical diagnosis, system fault diagnosis, multivariable control systems, computer graphics and vision, noise cancellation, and speech analysis. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Algorithms; Adaptive Control

19980009896 Northeastern Forest Experiment Station, Forestry Sciences Lab., Delaware, OH USA

FRAN: Financial Ratio Analysis and More., Version 1 Final Report, (Final)

Hansen, B. G., Northeastern Forest Experiment Station, USA; Palmer, A. J., Northeastern Forest Experiment Station, USA; Feb. 6, 1997; 17p; In English

Report No.(s): PB97-137277; FSGTR-NE-231; NEFES/97-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

FRAN is a computer-based, stand-alone program designed to generate important financial and operating ratios from tax and wage forms filed with the Internal Revenue Service. FRAN generates standard profitability, financial/leverage, liquidity/solvency, and activity ratios, as well as unique measures of workforce and capital cost and acquisition. Information produced by the program is of use to bankers contemplating short-term credit or an equity position, and to management in securing loans and evaluating operating performance.

NTIS

Computer Programs; Ratios; Finance; Abilities

19980009903 Purdue Univ., West Lafayette, IN USA

Modeling and Simulation in a Reconfigurable Distributed Virtual Environment Final Report, 1 Jan. - 31 Dec. 1996

Bajaj, Chandrajit L., Purdue Univ., USA; Dec. 1996; 6p; In English

Contract(s)/Grant(s): N00014-94-1-0370; N00014-95-I-1025

Report No.(s): AD-A330023; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Our research emphasizes modeling algorithms and data structures to support physical simulation and prototyping in a distributed and collaborative virtual environment. One new proposed thrust in geometric modeling algorithms is the use of algebraic splines (A-splines) in two, three and higher dimensions. The other main focus is to develop and demonstrate specific paradigms in our reconfigurable and interoperable distributed virtual environment SHASTRA, which would allow collaborating users to efficiently build three dimensional models from large measured point data sets (jet engines, automobiles, tanks, artificial implants, ...), generate surface and volume meshes coupled to these models and interactively modify the domain in response to the solution of physical phenomena (stress analysis, fluid dynamics). Furthermore, because of the SHASTRA software's distributed client-server nature, other modeling and simulation packages could be easily connected and interfaced for added functionality.

DTIC

Virtual Reality; Distributed Interactive Simulation; Data Structures; Algorithms

19980009941 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Attributes of Quality Scenarios/Scenario Sets Used In Software Requirements Elicitation

Braun, Kimberly A., Air Force Inst. of Tech., USA; Dec. 02, 1997; 149p; In English

Report No.(s): AD-A332328; AFIT-97-145; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In order for a quality software product to be developed, quality must exist from the beginning. One of the first stages in software development is requirements gathering. Scenarios help bring together the stakeholders of the future system to discuss and agree upon the requirements of the proposed system. This thesis examines scenarios used in software requirements elicitation. Many different definitions, formats, and ideas exist on scenarios, but no thorough work has been done on what makes a good, quality scenario and scenario set. This thesis will define quality for a scenario and scenario set. Research into the current state of practice of scenarios will reveal any references authors make with respect to quality attributes they want in their scenarios. Since the result of requirements elicitation is the Software Requirements Specification (SRS), research into what makes a quality SRS will inspire ideas for a quality scenario and scenario set. New, previously unmentioned attributes, generated from fresh, new thinking on the subject will round out the quality attribute list for scenarios and scenario sets that this thesis develops. Each attribute will be defined, justified, and examples shown of what a scenario or scenario set would be like if the attribute was missing and how the scenario or scenario set would be improved if the attribute were included. Although this paper does not claim to prove the resulting attribute list is sufficient for a quality scenario and scenario set, it will show the necessity of each attribute. Showing how the software lifecycle or other software development functions will be adversely affected if an attribute is missing will prove necessity.

DTIC

Software Engineering; Software Reliability

19980009944 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA

Technical Opportunities to Help with the Year 2000 Problem Final Report, 1 Nov. 1996 - 30 Sep. 1997

Reps, Thomas W., Wisconsin Univ., USA; Jan. 1997; 4p; In English

Contract(s)/Grant(s): N00014-97-I-0114

Report No.(s): AD-A332289; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The Year 2000 Problem (Y2K problem) concerns how to avoid the possible breakdown of computer systems due to the use (in both code and data) of only two digits to represent the year in dates. The purpose of this project was to plan a project aimed at reducing the impact of the Y2K problem on the Department of Defense. Some of the technical issues that considered included: (1) How to conduct experiments that involve setting dates ahead to determine impact, (2) How to locate places in a piece of code where dates are used, (3) How to perform impact analysis (either statically or dynamically) to determine what other parts of the code are affected by date manipulations, (4) Database reformatting and conversion, (5) Testing, (6) Dealing with multi-lingual systems, (7) Dealing with binary code systems (where the system is written in assembly code, the source code has been lost, or the source code was never delivered), and (8) Sand boxing or other techniques for isolating the effects of bad/old date formats. Also investigated are problems, opportunities, special risks, possibilities for high payoff etc. that were specific to the DoD context.

DTIC

Software Engineering; Software Reliability; Project Planning

19980009992 Army Research Lab., Weapons and Materials Directorate, Aberdeen Proving Ground, MD USA

Project Focus: A Study of Virtual Proving Ground Software Architecture Requirements Final Report

Sauerborn, Geoffrey C., Army Research Lab., USA; Smith, Kenneth G., Army Research Lab., USA; Scramlin, Alan W., Army Test and Evaluation Command, USA; Shankle, Robert R., Army Test and Evaluation Command, USA; Gauss, Robert W., Army Test and Evaluation Command, USA; Sep. 1997; 141p; In English

Report No.(s): AD-A330855; ARL-TR-1429; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

The virtual proving ground (VPG) is a concept being developed within the U.S. Army Test and Evaluation Command to harness the power of state-of-the-art sophisticated modeling and simulation technologies to augment and enhance test and evaluation in support of product acquisition. VPG is a cohesive and comprehensive capability for testing concepts, virtual prototypes, hardware prototypes, subsystems, and full systems. A broad, far-reaching, and diverse set of capabilities is envisioned within the VPG. Critical to the successful implementation of the VPG is an architecture able to support or enable those capabilities. A major function of the VPG architecture will be to integrate dissimilar heterogeneous engineering level models and simulations of prototype and production hardware and the synthetic environments in which they operate. In 1996, the U.S. Army Aberdeen Test Center and the U.S. Army Research Laboratory jointly conducted 'Project Focus' to help determine the architectural requirements that support the VPG concept. This report contains a description of Project Focus and the architectural requirements that resulted from it.

DTIC

Computer Programming; Program Verification (Computers); Simulation

19980010016 Computer Command and Control Co., Philadelphia, PA USA

Software Tools for Formal Specification and Verification of Distributed Real-Time Systems *Final Report*

Sep. 30, 1997; 25p; In English

Contract(s)/Grant(s): N00014-95-C-0131

Report No.(s): AD-A330059; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

It reports on the development of a set of software tools for specification and verification of distributed real time systems using formal methods. The task of this SBIR Phase 2 effort was to create a commercial-strength CASE toolset suitable for handling real-life verification problems. A preceding Phase 1 contract was concerned with development of the approach to the problem and design of a prototype environment. Forthcoming Phase 3 work will demonstrate the utility of the toolset to potential customers and establish it as a commercial off-the-shelf (COTS) specification and verification product. It is important to note that commercialization work, which is the task of Phase 3 efforts, has already begun during the current Phase 2 period (see Section 4). The toolset has been given the name PARAGON, which stands for 'Process-Algebraic Real-time Analysis with Graphics-Oriented Notation'. The toolset is intended to be used by designers of real-time systems for early detection of errors. The mathematical complexity of formal specification and verification has been hidden from the end users as much as possible. To achieve this, the specification language uses notions used by designers in their work as primitives. This provides for concise specifications, readable even by a non-specialist.

DTIC

Program Verification (Computers); Prototypes; Real Time Operation; Computer Programs

19980010022 Defence Science and Technology Organisation, Canberra, Australia

Software System Visualization: Netmap Investigations

Duffett, Peter, Defence Science and Technology Organisation, Australia; Vernik, Rudi, Defence Science and Technology Organisation, Australia; Jul. 1997; 69p; In English

Report No.(s): AD-A329962; DSTO-TR-0558; DODA-AR-010-284; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Defence systems have become increasingly reliant on software. The intangible and complex nature of software makes it difficult to manage and understand. Computer based visualisations of software have shown promise for providing the necessary visibility to acquire, develop, and maintain software systems. In this report we investigate a generic visualisation tool, Netmap, as a means of addressing these visualisation problems. Issues of using generic visualisation tools to support software tasks are discussed.

DTIC

Software Engineering; Computer Programs; Computer Graphics; Computer Aided Design

19980010023 Air Force Inst. of Tech., School of Logistics and Acquisition Management, Wright-Patterson AFB, OH USA

Calibration and Validation of the Sage Software Cost/Schedule Estimating System to USA Air Force Databases

Marzo, David B., Air Force Inst. of Tech., USA; Sep. 1997; 121p; In English

Report No.(s): AD-A329958; AFIT/GCA/LAS/97S-6; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This research entailed calibration and validation of the SAGE Software Cost/Schedule Estimating System, Version 1.7 as a means to improve estimating accuracy for DoD software-intensive systems, and thereby introduce stability into software system development. SAGE calibration consisted of using historical data from completed projects at the Space and Missile Systems Center (SMC) and the Electronic Systems Center (ESC) to derive average performance factors (i.e., calibration factors) for pre-defined categories of projects. A project was categorized for calibration by either its primary application or by the contractor that developed it. The intent was to determine the more appropriate categorization for calibration. SAGE validation consisted of using the derived calibration factors to predict completed efforts, not used in deriving the factors. Statistical resampling employing Monte Carlo simulation was used to calibrate and validate the model on each possible combination of a category's projects. Three statistical measures were employed to measure model performance in default and calibrated estimating modes. SAGE generally did not meet pre-established criteria for estimating accuracy, although the model demonstrated some improvement with calibration. Calibration of projects categorized by contractor resulted in better calibrated model performance than calibration of projects categorized by application. This categorization is suggested for future consideration.

DTIC

Computer Programming; Computer Programs; Missile Systems; Monte Carlo Method; Program Verification (Computers); Software Engineering; Systems Engineering; Systems Stability

19980010031 Army Research Lab., Adelphi, MD USA

A Generic Validation Methodology for Multispectral Synthetic Scene Generator Models *Final Report, Oct. 1996 - Sep. 1997*

Sola, Marcos C., Army Research Lab., USA; Orletsky, Mark W., Army Research Lab., USA; Vuong, Quochien B., Army Research Lab., USA; Kohler, Charles R., Army Research Lab., USA; Oct. 1997; 24p; In English

Report No.(s): AD-A332048; ARL-TR-1446; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The establishment of a sufficient, field-measured database to support the analysis of automatic target recognition (ATR) algorithms, sensor fusion effectiveness, and sensor system performance for multiple combinations of targets, environments, sensors, and locations will severely challenge the limited, available resources currently within the U.S. Army research community. However, the use of a high-resolution, synthetic scene generator model (SSGM) for time-independent applications can alleviate the database requirement. We propose a methodology for a robust validation of SSGM that will consist of defining sets of images (real and corresponding SSGM imageries) and using human observers to define a baseline. First-order comparisons of a real scene to a synthetic scene will be performed with the use of the filters in the Tank-Automotive Research, Development and Engineering Center (TARDEC) model or a comparable computational vision model (CVM). The similarity of target-to-background histograms as a function of various CVM filters will need to be analyzed to define first-order effects. Second-order metrics are defined in terms of probability of detection, detection timeline, and false alarm rate. A metric for the target signature will be mathematically defined to test these second-order effects. For a given application, the necessary and sufficient metrics are discussed.

DTIC

Target Recognition; Image Processing

19980010043 Rome Lab., Griffiss AFB, NY USA

A New Efficient Algorithm for Approximation, Jan. - Sep. 1993

Slaski, Lisa K., Rome Lab., USA; Rangaswamy, Murali, Rome Lab., USA; Aug. 1997; 31p; In English

Contract(s)/Grant(s): AF Proj. 4506

Report No.(s): AD-A329961; RL-TR-97-73; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Classical radar signal processing techniques assume that the signal interference is Gaussian in nature. However, it has been shown that this interference or clutter is not always Gaussian. When non-Gaussian clutter exists, other signal processing techniques which are optimal, or more robust in non-Gaussian clutter may be more effective than the classical techniques. This requires determination of the clutter characteristics for each clutter region and then applying the appropriate signal processing technique to the data ideally in real time. In order to achieve real time it is necessary to determine this approximate Probability Density Function (PDF) using small sample data set sizes. However, until the development of the Ozturk Algorithm, there has not existed an efficient algorithm to determine an approximate PDF for a small clutter data sample set. The Ozturk Algorithm is a new statistical algorithm capable of approximating the PDF of a set of random data using on the order of 100 sample points, whereas classical techniques typically require thousands of samples. It consists of two parts, a goodness of fit test and the PDF Approximation. The goodness of fit test determines whether a sample data set is statistically consistent with a given PDF. The PDF Approximation selects the best approximate PDF from a variety of PDFs and is simply an extension of the goodness of fit test. This report describes the Ozturk Algorithm and shows an application of the algorithm to some temporal L-band radar clutter data.

DTIC

Algorithms; Approximation; Real Time Operation; Probability Theory; Ultrahigh Frequencies; Radar Data

19980010105 NERAC, Inc., Tolland, CT USA

Field Programmable Gate Arrays. (Latest Citations from the U.S. Patent Bibliographic File with Exemplary Claims)

Mar. 1996; In English

Report No.(s): PB96-866058; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning field programmable gate arrays (FPGAs) used in data communication. FPGA is comprised of cells which perform logical functions on input signals. The design and fabrication of programmable interconnecting, routing, and switching networks used in cell blocks are presented. References cover programmable antifuse structures, adder-based cells, combinatorial and sequential logic circuits and modules, routing structures, and self-testing circuits. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Gates (Circuits)

19980010124 Oregon Graduate Inst. of Science and Technology, Beaverton, OR USA

Making Production Operating System Kernels Adaptive: Incremental Specialization in Practice (Synthetix Project) Final Report

Pu, Calton, Oregon Graduate Inst. of Science and Technology, USA; Oct. 1997; 21p; In English

Contract(s)/Grant(s): N00014-94-1-0845; DARPA Order-B752

Report No.(s): AD-A329861; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We summarize the results produced by the DARPA contract 'Making Production Operating System kernels Adaptive: Incremental Specialization in Practice', also known as the Synthetix Project. The main objective of the project is to develop specialization technology to improve the modularity, adaptiveness, and performance of production operating system code. The main results are software toolkits that help programmers to build systems with specialized components that maintain their modularity and portability. The project is being extended by the Microlanguage and Immunix projects. We have released the Synthetix Specialization Toolkit and Software Feedback Toolkit.

DTIC

Software Engineering; Technologies; Modularity; Adaptation; Performance Prediction; Operating Systems (Computers)

19980010183 Colorado State Univ., Dept. of Mathematics, Fort Collins, CO USA

Optimization Problems in Multitarget/Multisensor Tracking Final Report, 1 Apr. 1995 - 31 Mar. 1997

Poore, Aubrey B., Colorado State Univ., USA; Jan. 1997; 39p; In English

Contract(s)/Grant(s): F49620-95-I-0136

Report No.(s): AD-A332052; AFOSR-97-0670TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The ever-increasing demand in surveillance is to produce highly accurate target and track identification and estimation in real-time, even for dense target scenarios and in regions of high track contention. The use of multiple sensors, through more varied information, has the potential to greatly enhance target identification and state estimation. For multitarget tracking, the processing of multiple scans all at once yields the desired track identification and accurate state estimation; however, one must solve an NP-hard data association problem of partitioning observations into tracks and false alarms in real-time. This report summarizes the development of a multisensor-multitarget tracker based on the use of near-optimal and real-time algorithms for the data association problem and is divided into several parts. The first part addresses the formulation of multisensor and multiscan processing of the data association problem as a combinatorial optimization problem. The new algorithms under development for this NP-hard problem are based on a recursive Lagrangian relaxation scheme, construct near-optimal solutions in real-time, and use a variety of techniques such as two-dimensional assignment algorithms, a bundle trust region method for the nonsmooth optimization, and graph theoretic algorithms for problem decomposition. A brief computational complexity analysis as well as a comparison with some additional heuristic and optimal algorithms is included to demonstrate the efficiency of the algorithms. New results on numerical efficiency and increased robustness for track maintenance are also discussed. This program has produced two U.S. patents with a third pending and has developed the basis for the Best of Breed Tracker Contest winner at Hanscom AFB in 1996.

DTIC

Target Recognition; Real Time Operation; Multisensor Applications; Combinatorial Analysis

19980010435 Rutherford Appleton Lab., Dept. for Computation and Information, Chilton, UK

Exploiting Negative Curvature Directions in Linesearch Methods for Unconstrained Optimization

Gould, N. I. M., Rutherford Appleton Lab., UK; Lucidi, Stefano, Rome Univ., Italy; Roma, Massimo, Rome Univ., Italy; Toint, Philippe L., Facultes Univ. Notre-Dame de la Paix, Belgium; Dec. 1997; 15p; In English; Sponsored in part by the British Council. Report No.(s): RAL-TR-97-064; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire OX11 0QX, UK), Hardcopy, Microfiche

In this paper we consider the definition of new efficient linesearch algorithms for solving large scale unconstrained optimization problems which exploit the local nonconvexity of the objective function. Existing algorithms of this class compute, at each iteration, two search directions: a Newton-type direction which ensures a global and fast convergence, and a negative curvature direction which enables the iterates to escape from the region of local nonconvexity. A new point is then generated by performing a movement along a curve obtained by combining these two directions. However, the respective scaling of the directions is typically ignored. We propose a new algorithm which aims to avoid the scaling problem by selecting the more promising of the two directions, and then performs a step along this direction. The selection is based on a test on the rate of decrease of the quadratic model of the objective function. We prove global convergence to second-order critical points for the new algorithm, and report some preliminary numerical results.

Author

Algorithms; Searching; Optimization; Iteration; Curvature

19980010444 Army Research Lab., Atlanta, GA USA

Investigation of Cortical Oscillation Models Within the Visual Cortex Final Report

Raglin, Adrienne, Army Research Lab., USA; Johnson, John, Army Research Lab., USA; Oct. 1997; 22p; In English
Report No.(s): AD-A332560; ARL-TR-1512; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computer vision deals with algorithms that allow machines to detect, segment, feature extract, and recognize objects in an image. There are numerous applications in medicine, manufacturing, and security for this technology. By studying the visual processes of biological systems, enhancements can be achieved in the development of computer vision algorithms. One biological function of interest involves the oscillatory pulses generated in the primary visual cortex engaged in stimulus-specific oscillatory responses. As a result of these experiments, it can be concluded that these tightly correlated, stimulus-induced oscillations may play a role in the recognition of images. Therefore these cortical oscillations have been modeled to investigate their ability to segment objects in a visual field. This report briefly discusses the visual system and the internally stimulus-dependent oscillations that may lead to identification of images. Emphasis will be on the models that attempt to reproduce this biological phenomena, their computational and behavioral aspects, as well as simulation performance. Detail will be given to their computational and behavioral aspects since it is in these areas that possible improvements can be achieved through more detailed modeling.

DTIC

Algorithms; Computer Vision; Visual Stimuli; Oscillations

19980010523 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA

Software Support For Programming-in-the-Large Final Report

Reps, Thomas W., Wisconsin Univ., USA; Jan. 1997; 7p; In English

Contract(s)/Grant(s): ARPA ORDER-8856

Report No.(s): AD-A332112; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this project was to create enhanced tools to support the development of complex software systems. The objective was to create tools that provide powerful language-specific program-manipulation operations for aiding programmers in maintaining, enhancing, and the reuse of code. The main activities of the project were devoted to: Program slicing, A new approach to program analysis, Techniques for pointer analysis and shape analysis, Incremental computation, Development of the CAPITL program-development environment.

DTIC

Computer Programming; Software Engineering; Digital Techniques

19980010530 Naval Command, Control and Ocean Surveillance Center, San Diego, CA USA

CMS-2 to Ada Translator Evaluation Final Report

Iwamiya, Ron, Naval Command, Control and Ocean Surveillance Center, USA; Mumm, Hans, Naval Command, Control and Ocean Surveillance Center, USA; Ollerton, Bob, Naval Command, Control and Ocean Surveillance Center, USA; Riegle, Bryan, Naval Command, Control and Ocean Surveillance Center, USA; Colket, Currie, Naval Command, Control and Ocean Surveillance Center, USA; Sep. 1997; 268p; In English

Report No.(s): AD-A331889; NRAD-TD-2984; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

The objective of this evaluation was to determine the maturity of the CMS-2 to Ada translators and associated tools, to determine the capabilities of these translators, and to provide information to CMS-2 project managers to assist them in the evaluation of costs and risks of translating CMS-2 to Ada.

DTIC

Ada (Programming Language); Object-Oriented Programming

19980010531 RAND Corp., Santa Monica, CA USA

A Guide for Analysis Using Advanced Distributed Simulation (ADS)

Lucas, Thomas, RAND Corp., USA; Kerchner, Robert, RAND Corp., USA; Friel, John, RAND Corp., USA; Jones, Daniel, RAND Corp., USA; Jan. 1997; 109p; In English

Contract(s)/Grant(s): F49642-96-C-0001

Report No.(s): AD-A331885; RAND/MR-879-AF; ISBN 0-8330-2465; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The purpose of this report is to assist those in the vanguard of using Advanced Distributed Simulation (ADS) for analysis. The report discusses a broad range of issues critical to successful ADS supported analyses. Major topic areas include potential ADS analysis strengths and weaknesses, the role ADS might play within a broader analysis strategy, experimental design, exercise preparation and management, and post-exercise analysis. Because it is impossible to comprehensively treat all of these subjects,

we emphasize the breadth of analysis issues over depth in their coverage with references to more detailed resources. Furthermore, the depth of coverage is highly variable. The greatest detail is provided on the roles of ADS in the analysis process and in experimental design.

DTIC

Experiment Design; Management Analysis; Physical Exercise

19980010532 California Univ., Dept. of Computer Science, Los Angeles, CA USA

Probabilistic Counterfactuals: Semantics, Computation, and Applications *Final Report, 1 Jul. 1993 - 30 Jun. 1996*

Balke, Alexander A., California Univ., USA; Pearl, Judea, California Univ., USA; Feb. 05, 1997; 164p; In English

Contract(s)/Grant(s): F49620-93-I-0421

Report No.(s): AD-A332296; AFOSR-TR-97-0629; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

We have reformulated Bayesian networks as carriers of causal information. The result is a more natural understanding of what the networks stand for, what judgments are required in constructing the network and, most importantly, how actions and plans are to be handled within the framework of standard probability theory. Starting with functional description of physical mechanisms, we were able to derive the standard probabilistic properties of Bayesian networks and to show: (1) how the effects of unanticipated actions can be predicted from the network topology, (2) how qualitative causal judgments can be integrated with statistical data, (3) how actions interact with observations, and (4) how counterfactuals sentences can be formulated and evaluated.

DTIC

Bayes Theorem; Statistical Analysis

19980010535 Arizona Univ., Dept. of Aerospace and Mechanical Engineering, Tucson, AZ USA

Advanced Pre and Post Processing Equipment for Time Dependent Numerical Simulation of Complex Flows *Final Report, 15 Jan. 1995 - 14 Jan. 1997*

Fasel, Hermann, Arizona Univ., USA; Jun. 26, 1997; 8p; In English

Contract(s)/Grant(s): F49620-95-I-0123

Report No.(s): AD-A332108; AFOSR-97-0675; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

With the funding from DURIP grant F 49620-95-1-0123 a total of seven workstations from Silicon Graphics Inc. and several peripherals and accessories, including a 36 GB disk array have been purchased. This equipment has been utilized effectively to perform pre- and post-processing tasks for our DOD funded research projects. The instrumentation is very well suited to perform our high needs of fast disk I/O in order to display time-dependent data for the post-processing. In addition, the multi-processor workstations have allowed us to develop and test our Navier-Stokes codes locally and improve their performance before performing production runs at the DOD High-Performance Computing Centers.

DTIC

Navier-Stokes Equation; Workstations

19980010542 Michigan Univ., Dept. of Civil Engineering, Ann Arbor, MI USA

Experimental Micromechanics of Geomaterials Through Computer Visualization *Final Report, 1 Jun. 1993 - 31 May 1996*

Hryciw, Roman D., Michigan Univ., USA; Oct. 30, 1996; 4p; In English

Contract(s)/Grant(s): F49620-93-I-0406

Report No.(s): AD-A332410; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The objective of the research program was development of computer vision techniques for experimental soil micromechanics and for characterization of soils, both in the laboratory and in-situ. for micromechanics research, a particle tracking system consisting of state-of-the-art hardware and developed software tools, was assembled for monitoring the kinematics of particulate assemblies undergoing large strain deformations and flow. The utility of this system, the testing methodologies and the suite of developed applications: flow of soil through an orifice at the base of a container; the plowing of soil off of plain strain embankment and the development of shear bands in soil around an advancing ribbed inclusion. The major demonstrated use for this system was in verification of discrete element models with particular focus on the development of strain localization and shear banding.

DTIC

Computer Vision; Micromechanics; SOILs

19980010548 Massachusetts Inst. of Tech., Cambridge, MA USA

A Unified Framework for Verification and Complexity Analysis of Real-Time and Distributed Systems *Final Report, Aug. 1993 - Feb. 1997*

Lynch, Nancy, Massachusetts Inst. of Tech., USA; Jun. 13, 1997; 57p; In English

Contract(s)/Grant(s): F49620-94-I-0199

Report No.(s): AD-A332549; AFOSR-97-0648TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

We have developed the timed I/O automaton model, a basic compositional formal model for describing and analyzing real-time systems and distributed systems (in particular, distributed systems with precise timing assumptions and requirements). We have developed proof techniques, both manual and computer-assisted, for use with timed I/O automata, and have used the model and methods for analyzing a variety of problems and systems. These examples arise from a diverse set of application areas, including connection management protocols, clock synchronization, fault-tolerant distributed consensus, group communication, and real-time process control systems. We have extended the basic timed I/O automaton model in three directions: to include liveness constraints (Live timed I/O automata), hybrid continuous/discrete behavior (hybrid I/O automata), and probabilistic behavior (probabilistic timed I/O automata). In each case, we have developed proof methods and have applied the models and methods to substantial problems. For example, in the hybrid systems area, we have carried out an extended case study of safety aspects of automated transportation systems. We have recently begun the development of a programming language/environment, based upon our formal models, and intended to support the coordinated development and analysis of distributed systems.

DTIC

Data Processing; Proving; Real Time Operation; Distributed Processing

19980010576 Battelle Memorial Inst., Columbus, OH USA

Software Maintenance Manual for the Consolidated Serviceable Inventory Visibility and Management Tool (CSIViz)

May 31, 1997; 473p; In English

Contract(s)/Grant(s): F33657-92-D-2055

Report No.(s): AD-A330602; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

The purpose of this Software Maintenance Manual (SMM) for the Consolidated Serviceable Inventory Visibility and Management Tool (CSIViz) is to provide maintenance programmer personnel with the information necessary to effectively maintain and modify the User Program. CSIViz contains a primary program engine that includes the necessary functions to execute the User Program. This SMM examines this program engine by listing the Table Definitions and Module Descriptions associated with the database. In addition, ERWin diagrams examining the relationships within the User Program and central and local databases are included. A basic understanding of table and module design is assumed.

DTIC

User Manuals (Computer Programs); Software Engineering

19980010593 Aerospace Corp., Engineering and Technology Group, El Segundo, CA USA

SDVS 13 Users' Manual

Marcus, L. G., Aerospace Corp., USA; Sep. 30, 1994; 364p; In English

Report No.(s): AD-A330004; ATR-94(4778)-5; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This is a guide for users of the State Delta Verification System (SDVS), Version 13. Its style is somewhere between that of a tutorial and a reference manual. All facets of the verification system are covered here: the underlying logic (state deltas), the proof language, the user interface, the actual use of the system, the translation from the register-transfer-level language ISPS to state deltas, the translation from Ada to state deltas, the translation from VHDL to state deltas, the capabilities of the static solvers, and example proofs. A set of exercises is provided in the last chapter and a comprehensive SDVS bibliography is included.

DTIC

User Manuals (Computer Programs); Hardware Description Languages; Interfaces; Ada (Programming Language); Translating; Deltas

19980010604 Naval Postgraduate School, Monterey, CA USA

Knapsack Cuts and Explicit-Constraint Branching for Solving Integer Programs

Applegate, Jeffrey A., Naval Postgraduate School, USA; Jun. 1997; 146p; In English

Report No.(s): AD-A331891; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Enhanced solution techniques are developed for solving integer programs (IPs) and mixed-integer programs (MIPs). Previously unsolvable problems can be solved with these new techniques. We develop knapsack cut-finding procedures for minimal cover cuts, and convert existing cut-strengthening theory into practical procedures that lift and tighten violated minimal cover valid inequalities to violated knapsack facets in polynomial time. We find a new class of knapsack cuts called 'non-minimal cover cuts' and a method of lifting them called 'deficit lifting.' Deficit lifting enables all of these cuts to be lifted and tightened to facets as well. Extensions of these techniques enable us to find cuts for elastic knapsack constraints and cuts for non-standard knapsack constraints. We also develop the new technique of 'explicit-constraint branching' (ECB). ECB enables the technique of constraint

branching to be used on IPs and MIPs that do not have the structure required for known 'implicit constraint branching' techniques. When these techniques are applied to 84 randomly generated generalized assignment problems, the combination of knapsack cuts and explicit-constraint branching were able to solve 100% of the problems in under 1000 CPU seconds. Explicit constraint branching alone solved 94%, and knapsack cuts solved 93%. Standard branch and bound alone solved only 38%. The benefits of these techniques are also demonstrated on some real-world generalized assignment and set-partitioning problems.

DTIC

Inequalities; Integers; Nonlinear Programming; Polynomials

19980010607 Wisconsin Univ., Madison, WI USA

Speeding up Slicing

Reps, Thomas, Wisconsin Univ., USA; Horwitz, Susan, Wisconsin Univ., USA; Sagiv, Mooly, Wisconsin Univ., USA; Rosay, Genevieve, Wisconsin Univ., USA; Jan. 1997; 10p; In English

Contract(s)/Grant(s): N00014-92-J-1937

Report No.(s): AD-A332113; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Program slicing is a fundamental operation for many software engineering tools. Currently, the most efficient algorithm for interprocedural slicing is one that uses a program representation called the system dependence graph. This paper defines a new algorithm for slicing with system dependence graphs that is asymptotically faster than the previous one. A preliminary experimental study indicates that the new algorithm is also significantly faster in practice, providing roughly a 6-fold speedup on examples of 348 to 757 lines.

DTIC

Software Development Tools; Software Engineering; Object-Oriented Programming; Systems Engineering

19980010769 Lawrence Livermore National Lab., Livermore, CA USA

Computer Modeling in the Design and Evaluation of Electric and Hybrid Vehicles

Aceves, Salvadore, Lawrence Livermore National Lab., USA; Smith, Ray J., Lawrence Livermore National Lab., USA; Johnson, Norman L., Los Alamos National Lab., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 337-350; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Light-duty vehicles (consumer automobiles) are major contributors to urban air pollution and greenhouse emissions. They also consume much of the oil supply to the country, causing oil dependence on unreliable foreign sources. This demonstration project uses modern simulation techniques to illustrate the important technologies and design variables that an auto-designer would consider in producing a high efficiency, low emissions vehicle. Simulation and modeling techniques use the idea of capturing the relationships between real components of the system with mathematical equations. These equations are then solved on a computer to simulate the behavior or performance of the system under various conditions. Simulations and models are a useful analysis tool for the following reasons: to provide insight and understanding of the real system, especially the complex dynamics from the interaction of simple physics; to predict the performance, given modifications of the system; to supplement experimental results especially when experiments are costly, unavailable or of low fidelity; To optimize the performance of the system; to develop control or operation strategies of the system. In the current demonstration project, we focus on many variations of a hydrogen-powered vehicle. The fuel that powers the vehicle is hydrogen gas. When hydrogen is burned in the presence of lots of oxygen (a lean mixture), the only combustion product is water. There is almost no poisonous carbon monoxide (CO); or carbon dioxide (CO₂) produced, an undesirable greenhouse gas; and very little nitric or nitrous oxides (NO and NO₂), pollutants that cause brown hazes and are very irritating to the lungs. Furthermore, hydrogen can be produced from renewable sources, such as solar or wind power, thereby eliminating our dependence on oil in the US and on foreign oil. Even more exciting is that when used in a fuel cell or a properly designed combustion engine, the power plant can achieve very high efficiencies, much higher than modern gasoline engines used in automobiles. The demonstration project also focuses on a particular type of vehicle, the series hybrid vehicle, that has been shown to have a high operating efficiency. When the high efficiency, low emission hydrogen engine is combined with a high efficiency series hybrid vehicle, the result is a vehicle that has nearly zero emissions, performs well, and is highly efficient.

Author

Computerized Simulation; Automobiles; Combustion Products; Design Analysis; Electric Hybrid Vehicles; Hydrogen Engines

19980010818 Rome Lab., Griffiss AFB, NY USA

A Methodology for Assessing Software Releasability

Kochan, Matthew J., Rome Lab., USA; Oct. 1997; 98p; In English

Contract(s)/Grant(s): AF Proj. 2183

Report No.(s): AD-A331874; RL-TM-97-2; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

A distinct challenge of Software engineering is the tradeoff between developing a high quality software product and delivering it on schedule. This thesis proposes a new methodology which addresses this tradeoff. The term 'releasable' Software is introduced as a product which demonstrates a fault content acceptable to users in the field. The releasability assessment methodology capitalizes on basic testing metrics, software reliability modeling, statistical analysis techniques, and program specific criteria to present an objective estimation of the software release date. It is illustrated as an adaptive series of detailed procedures tailored to the unique needs and assumptions of the program. A division of Rome Laboratory recognized for medium-large scale software development provides the perspective for investigating finer points of the methodology. A notion of Configuration Reliability and the importance of system configuration management are presented. The impact configuration problems can have on software testing is discussed and a root cause analysis technique is recommended for achievement of optimal releasability.

DTIC

Software Engineering; Technology Utilization; Program Verification (Computers); Software Reliability; Tradeoffs

19980010838 Dragon Systems, Inc., Newton, MA USA

The Voice-Activated Multilingual Interview System *Final Report*

Bamberg, Paul G., Dragon Systems, Inc., USA; Kunz, Carol, Dragon Systems, Inc., USA; Aug. 1997; 30p; In English
Contract(s)/Grant(s): MDA972-96-C-0007

Report No.(s): AD-A332003; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Multilingual Interview System is a Windows-based application program designed to let users conduct simple interviews by voice in languages they do not speak. Any statement or question that is within the vocabulary, when spoken into a microphone attached to the computer, is recognized by a large-vocabulary speech recognition system and converted into a sequence of pre-recorded wave files which are then played back through a loudspeaker attached to the computer. The development of the operational applications for this system was done by NOMI in Pensacola, Florida. Dragon Systems, Inc. developed and customized the underlying speech recognition technology and produced the application software that connects the spoken input to the spoken output as well as the software to record foreign-language wave files for playback. The system was tested at Ft. Bragg and deployed in Bosnia on laptop, handheld and wearable computers.

DTIC

Speech Recognition; Programming Languages; Applications Programs (Computers)

19980010849 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Behavioral Relationships Between Software Components

Gibson, David S., Air Force Inst. of Tech., USA; Oct. 27, 1997; 187p; In English

Report No.(s): AD-A331990; Rept-97-129D; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

Building software systems from reusable software components has been a goal of software engineers for nearly three decades. Despite progress, the realization of this goal remains surprisingly elusive. Expensive hardware systems such as aircraft, communication networks, and factory assembly lines are designed so that various subsystems (both hardware and software) can be removed and replaced in order to change the performance and functionality of the overall system. In a similar manner, it should be possible to change the behavior of a component-based software system in useful and predictable ways by removing and replacing entire components. In order to perform component-level maintenance, an engineer must understand not only the structural relationships but also the behavioral relationships among the component to be replaced, the system, and the replacement component. These behavioral relationships need to be clearly documented and available to engineers developing and maintaining component-based systems. This dissertation presents a small set of precisely defined relationships that concisely express behavioral relationships between software components. These relationships may be used to provide implementers and maintainers with useful information about how components can and should be composed when integrated into component-based systems. Furthermore, these relationships encourage strict adherence to the well-established software engineering principles of modularity, information hiding, polymorphism, and extendibility. The relationships described are language-independent and may be encoded in a variety of ways using modern programming languages. The dissertation describes how interface-only components, templates, inheritance, and other language mechanisms may be used to encode these relationships.

DTIC

Software Engineering; Computer Systems Programs; Communication Networks; Software Reuse

19980010858 Massachusetts Inst. of Tech., Dept. of Electrical Engineering and Computer Science, Cambridge, MA USA
Applications of the Theory of Distributed and Real-Time Systems to the Development of Large-Scale Timing Based Systems *Progress Report, 1 Jan. - 31 Mar. 1997*

Lynch, Nancy, Massachusetts Inst. of Tech., USA; Apr. 15, 1997; 13p; In English

Contract(s)/Grant(s): F19628-95-C-0118

Report No.(s): AD-A331503; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This R&D status report covers (1) modeling and verification tools, (2) algorithms and impossibility results, and (3) applications.

DTIC

Distributed Processing; Real Time Operation; Algorithms

19980010870 Wisconsin Univ., Madison, WI USA

Wisconsin Program-Slicing Tool 1.0 Reference Manual

Jan. 1997; 29p; In English

Report No.(s): AD-A332520; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Wisconsin Program-Slicing Tool is a prototype system that supports backward and forward slicing operations that help the user gain an understanding of what a program does and how it works. At the heart of the system is a package for manipulating Program Dependence Graphs (PDGs) and an extension of program dependence graphs, called System Dependence Graphs (SDGs). System dependence graphs represent patented technology, the rights to which are held by the Wisconsin Alumni Foundation. This document describes the basic command set of the Slicing Tool. An overview of the system's theoretical underpinnings can be found in. The user interface for the Slicing Tool incorporates a language-specific editor created using the Synthesizer Generator, a meta-system for creating interactive, language-based program-development systems. As with all editors created with the Synthesizer Generator, the Slicing Tool's editor exhibits characteristics that are specific to the Slicing Tool, while at the same time sharing the generic user interface described in Chapter 5 of The Synthesizer Generator Reference Manual. This document primarily describes the commands that are specific to the Slicing Tool—for example, for invoking slicing operations as opposed to commands that are part of the standard user interface of editors created with the Synthesizer Generator.

DTIC

Computer Programming; Slicing; Technologies; Tools

19980010880 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK

Definition and Evaluation of Adaptive Fault-Tolerant Architectures in a Distributed Computing Environment

Xu, J., Newcastle-upon-Tyne Univ., UK; Di Giandomenico, F., Consiglio Nazionale delle Ricerche, Italy; Bondavalli, A., Consiglio Nazionale delle Ricerche, Italy; Chiaradonna, S., Consiglio Nazionale delle Ricerche, Italy; Apr. 1997; 27p; In English
Contract(s)/Grant(s): ESPRIT-BRA-3092; ESPRIT-BRA-6362; ESPRIT Proj. 20072

Report No.(s): PB97-176655; TRS-593; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper discusses the issue of providing tolerance to both hardware and software faults in a distributed computing environment. The authors define several hybrid-fault-tolerant architectures that can co-exist and work simultaneously at the top of the supporting environment, and introduce a systematic method for evaluating their dependability, efficiency, and response time.

NTIS

Fault Tolerance; Hardware; Memory (Computers); Distributed Processing; Adaptation

19980010893 Illinois Univ., Dept. of General Engineering, Urbana, IL USA

Rapid Solutions to Hard Problems Using Fast Messy Genetic Algorithms *Final Report, 1 Jan. 1994 - 30 Sep. 1996*

Goldberg, David E., Illinois Univ., USA; Feb. 25, 1997; 1p; In English

Contract(s)/Grant(s): F49620-94-I-0103

Report No.(s): AD-A332334; AFOSR-97-0652TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This project developed and applied a type of non-traditional genetic algorithm called a fast messy genetic algorithm (fmGA). Critical bounding theory and computational experiments show that fmGAs converge to high quality solutions with high probability in times that grow no faster than a sub quadratic function of the number of decision variables. These results have important ramifications for the design and operation of the next generation of Air Force systems.

DTIC

Genetic Algorithms; Optimization

19980010898 Naval Postgraduate School, Monterey, CA USA

Markov Random Field Textures and Applications in Image Processing

Korn, Christopher A., Naval Postgraduate School, USA; Mar. 1997; 78p; In English

Report No.(s): AD-A331947; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In the field of image compression, transmission and reproduction, the foremost objective is to reduce the amount of information which must be transmitted. Currently the methods used to limit the amount of data which must be transmitted are compression algorithms using either lossless or lossy compression. Both of these methods start with the entire initial image and compress it using different techniques. This paper will address the use of Markov Random Field Textures in image processing. If there is a texture region in the initial image, the concept is to identify that region and match it to a suitable texture which can then be represented by a Markov random field. Then the region boundaries and the identifying parameters for the Markov texture can be transmitted in place of the initial or compressed image for that region.

DTIC

Image Processing; Markov Processes; Data Compression

19980010903 Guild Associates, Inc., Baltimore, MD USA

Development of a Multi-Channel Integration Routine in LabVIEW Final Report, Jun. - Dec. 1994

Wilson, Todd M., Guild Associates, Inc., USA; Sep. 1997; 25p; In English

Contract(s)/Grant(s): DAAA15-93-C-0070

Report No.(s): AD-A331651; ERDEC-CR-237; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A multi-channel integrator was developed in LabVIEW to replace single function desk top integrators. A test signal consisting of 1798 points was generated in LabVIEW and read into both the software integrator and an HP-3396 Series II for comparison. Two data generation rates were employed on the data set, 100 Hz and 20 Hz, resulting in run times of approximately 18 and 90 seconds, respectively. The software integrator was tested with a raw signal input and one employing simple hardware filtering using an RC circuit. (The resistance value was approximately 820 ohms, and the capacitor was approximately 2 μ F, providing approximately 40 - 60 Hz filtering.) The results from the software implementation of the integrator compare favorably with those recorded by the HP-3396. The software integrator has some difficulty when integrating overlapping peaks that could be overcome with a modified peak detection algorithm.

DTIC

Software Engineering; Algorithms; Computer Conferencing

19980010904 Naval Postgraduate School, Monterey, CA USA

Development and Application of a Multimedia Assessment Tool

Nixon, Daniel E., Naval Postgraduate School, USA; Mar. 1997; 88p; In English

Report No.(s): AD-A331654; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In the Naval Aviation community, interactive, multimedia computer based training is being explored as a cost effective alternative to traditional modes of training. This thesis develops an assessment tool for multimedia systems to be used in computer based training by combining performance recommendations for multimedia hardware and software. It delivers a checklist for multimedia developers to assess the capability of proposed multimedia systems.

DTIC

Computer Programs; Attack Aircraft; Computer Aided Design

19980010906 Department of the Navy, Washington, DC USA

Wavelet Projection Transform Features Applied to Real Time Pattern Recognition

Garcia, Joseph P., Inventor, Department of the Navy, USA; Apr. 07, 1997; 74p; In English

Patent Info.: US-Patent-Appl-SN-833482

Report No.(s): AD-D018599; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A computer vision system having improved means for characterizing the parameters of edge segments of an unknown object is disclosed. The unknown object is transformed by a digital camera into an image and transformed by a wavelet projection transform so as to decompose the unknown objects into their constituent multi-scale edge segment features and provide recognition of the unknown object by relating their constituent edge features to each other.

DTIC

Pattern Recognition; Real Time Operation; Computer Vision

19980010908 Duke Univ., Dept. of Computer Science, Durham, NC USA

Algorithms for Processing Large-Scale Data Final Report, Aug. 1993 - May 1997

Vitter, Jeffrey S., Duke Univ., USA; Aug. 25, 1997; 10p; In English

Contract(s)/Grant(s): DAAH04-93-G-0076

Report No.(s): AD-A332577; ARO-31513.1-MA-SDI; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The PI and coauthors have developed the first known algorithms for sorting problems in computational geometry, graph problems, and different forms of range searching that are simultaneously optimal in terms of storage space usage and I/O performance. The PI has worked on how to implement these algorithms in practice using a powerful I/O programming environment called TPIE. The working group discussed the strategic directions and challenges in the management and use of - storage systems - those components of computer systems responsible for the storage and retrieval of data. The performance gap between main and secondary memories shows no of vanishing, and thus continuing research into storage I/O will be essential to reap the full benefit from the advances occurring in many other areas of computer science. We identified a few strategic research goals and possible thrusts to meet those goals.

DTIC

Sorting Algorithms; Programming Environments; Data Storage; Information Retrieval

19980010927 Carnegie-Mellon Univ., Dept. of Computer Science, Pittsburgh, PA USA

Idealized CSP: Combining Procedures with Communicating Processes

Jul. 1997; 24p; In English

Contract(s)/Grant(s): N00014-93-I-0750; NSF CCR-94-12980

Report No.(s): AD-A331454; CMU-CS-97-126; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Idealized CSP is a programming language combining simply typed, call-by-name procedures with asynchronous communicating processes. The language also generalizes Reynolds' Idealized Algol by adding typed channels and the ability to spawn parallel processes. Procedures permit the encapsulation of common communication protocols and parallel programming idioms. Local variables and local channel declarations provide a way to delimit the scope of interference between parallel agents. The combination of procedures and communicating parallelism raises significant semantic problems. We show-perhaps surprisingly, given the fundamental differences in underlying process model-that ideas used to model the combination of shared variable parallelism and procedures can be adapted to the communication-based setting. This is further evidence in favor of the orthogonality of procedures and concurrency, and also shows that the shared-variable and communication-based paradigms have a lot in common, semantically. Our semantics introduces a generalization of 'transition traces' and 'possible worlds', incorporating an 'object oriented' treatment of channels. The semantics supports reasoning about safety and liveness properties of processes at the same time as validating natural laws of functional programming.

DTIC

Laws; Orthogonality; Parallel Programming; Programming Languages; Protocol (Computers); Semantics; Synchronism

19980010946 Environmental Protection Agency, Washington, DC USA

Transmittal of Guidance on the Use of Section 7003 of RCRA Final Report

Herman, S., Environmental Protection Agency, USA; Bulatao, L., Environmental Protection Agency, USA; Andrews, M., Environmental Protection Agency, USA; Oct. 20, 1997; 48p; In English

Report No.(s): PB98-108616; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The new guidance addresses the meaning of 'imminent and substantial endangerment', the legal requirements for initiating administrative and judicial actions under Section 7003, case screening factors, enforcement against violators of orders issued under Section 7003, and the relationship of Section 7003 to other authorities that allow EPA to address potential endangerment and to respond to the release of materials that may harm health or the environment.

NTIS

Optimization; User Requirements; Safety Factors; Health

19980011006 Transportation Safety Board of Canada, Ottawa, Ontario Canada

Data Analysis With Advanced Graphics

Poole, Michael R., Transportation Safety Board of Canada, Canada; Recording Aircraft Accident Data Proceedings; 1997, pp. 13.1-13.7; In English; Also announced as 19980010998; No Copyright; Avail: Issuing Activity (The Royal Aeronautical Society, 4 Hamilton Place, London, W1V 0BQ, UK), Hardcopy, Microfiche

The objective of this paper is to give the reader who is not familiar with the subject a general insight into how vital cockpit voice and flight data information is protected from the effects of aircraft crashes. It discusses the requirements imposed by regula-

tions for protection of cockpit voice and flight data recorders, the techniques employed to protect the recording medium from the effects of fire and crashes, and the methods used to demonstrate compliance with the regulations. The paper describes the techniques used in general terms only, because the details of the methods that companies use to protect their recorders vary, and the designs are often proprietary to the company and regarded as confidential.

Author

Aircraft Accidents; Flight Recorders; Data Recorders; Protection

19980011509 Naval Postgraduate School, Computer Science Dept., Monterey, CA USA

Formal Models Used for Automation in Software Development *Final Report, Jan. 1994 - Dec. 1997*

Berzins, Luqi, Naval Postgraduate School, USA; Berzins, Valdis, Naval Postgraduate School, USA; Nov. 14, 1997; 8p; In English
Report No.(s): AD-A332759; ARO-30989.33-MA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project is investigating formal models that can support automated methods supporting software development. We have focused on automation support for requirements elicitation, particularly for prototyping and the gathering requirements remotely via the Internet; on automation support for software evolution, particularly for automatically detecting the need for software maintenance actions using non monotonic logic, for capturing requirements dependencies and justifications using the REMAP extension of the IBIS model, for combining several modifications to a system, for coordinating parallel efforts of several designers and automating the associated configuration management tasks, and on automation support for software construction, particularly for using specifications in the design of software architectures, for automated generation of schedules for hard real time software, and for retrieval of reusable software components.

DTIC

Computer Programs; Software Engineering; Software Development Tools; Automatic Control; Configuration Management; Computer Programming

19980011548 National Inst. of Standards and Technology, Gaithersburg, MD USA

Application of the Pointer State Subgraph to Static Program Slicing

Binkley, D. W., National Inst. of Standards and Technology, USA; Lyle, J. R., National Inst. of Standards and Technology, USA; Mar. 1996; 22p; In English

Report No.(s): PB96-167838; NISTIR-5799; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A new technique for performing static analysis of programs that contain unconstrained pointers is presented. The technique is based on the pointer state subgraph: a reduced control flow graph that takes advantage of the fact that in any program there exists a smaller program that computes only the values of pointer variables. The pointer state subgraph is useful in building static analysis tools. As an example the application of the pointer state subgraph to program slicing is considered. Finally, some experimental results, obtained using the ANSI-C slicer Unravel, are reported. These results show a clear reduction in the time taken to compute data-flow information from programs that contain pointers. They also show a substantial reduction in the space needed to store this information.

NTIS

Computer Programs; Software Engineering; Data Flow Analysis; Information Flow; Static Tests

19980011549 Vrije Univ., Dept. of Mathematics and Computer Science, Amsterdam, Netherlands

SIM: A C++ Library for Discrete Event Simulation

Bolier, D., Vrije Univ., Netherlands; Elieens, A., Vrije Univ., Netherlands; Nov. 1994; 75p; In English

Report No.(s): PB96-168067; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In this report we give a full description of sim, a C++ library for discrete event simulation. The sim library supports both an event and process-oriented approach to developing simulations. Events as well as entities (which may be considered as events with states signifying episodes in its life-time) are provided as abstract classes that must be refined by the application programmer to define the actual events and entities participating in the simulation. The sim library is integrated with the hush library, thus offering powerful graphic and animation facilities. However, the sim library may also be used independently, on both UNIX and MS-Dos platforms. This report presents an overview of the classes constituting the sim library (including the classes event, entity, generator, resource, queue, histogram and analysis) as well as two standard examples illustrating the deployment of the classes in writing simulation programs. Also, an example is given of how to create a graphical animation of a particular simulation. The

appendix contains, moreover, a more extensive example of a jobshop simulation illustrating how the analysis class may be used to obtain measurements of complex queuing behavior.

NTIS

Computerized Simulation; Computer Programming; Computer Graphics; Libraries; Histograms; C++ (Programming Language)

19980011573 Stanford Univ., Dept. of Computer Science, Stanford, CA USA

Temporal Verification and Development of Reactive Programs *Final Report, 15 Feb. 1993 - 29 Jun. 1996*

Manna, Zohar, Stanford Univ., USA; Nov. 1996; 12p; In English

Contract(s)/Grant(s): F49620-93-I-0139

Report No.(s): AD-A329718; AFOSR-97-0425TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The REACT research group at Stanford under the supervision of Professor Zohar Manna, developed methodologies and tools for the verification and synthesis of reactive, real-time and hybrid systems based on their temporal specifications. A system, STeP (Stanford Temporal Prover), has been implemented to support computer-aided verification and synthesis based on these methodologies and tools. The goal of the system is to automate the development process as much as possible, thereby reducing the errors that otherwise pervade software development. The research group consisted of Prof. Zohar Manna (PI), Prof. Amir Pnueli (visitor), 8 PhD students, 2 MSc students, and a programmer. One of the PhD students graduated during the period covered by this report. Several of the PhD students were supported by this AFOSR grant.

DTIC

Software Engineering; Systems Analysis; Technologies; Computer Programming

19980011576 Naval Research Lab., Surface Electronic Warfare Systems Branch, Washington, DC USA

A Fuzzy Logic Multisensor Association Algorithm: Theory and Simulation

Smith, James F., III, Naval Research Lab., USA; Sep. 30, 1997; 24p; In English

Report No.(s): AD-A330176; NRL/FR/5740--97-9866; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A recursive multisensor association algorithm has been developed based on fuzzy logic. It simultaneously determines fuzzy grades of membership and fuzzy cluster centers. It is capable of associating data from various sensor types and performing without operator intervention. It associates data from the same target for multiple sensor types. The algorithm also provides an estimate of the number of targets present, reduced noise estimates of the quantities being measured, and a measure of confidence to assign to the data association. The fuzzy logic formalism used offers the opportunity to incorporate additional information or heuristic rules easily. A comparison of the algorithm to a more conventional Bayesian association algorithm is provided. Also, procedures for defuzzification, i.e., mapping fuzzy results to hard results are discussed as well as the method of determining target validity. Various simulated real time data sets are analyzed and provide a basis for comparison of the fuzzy and Bayesian association algorithms.

DTIC

Algorithms; Formalism; Fuzzy Systems; Electrical Measurement; Electronic Transducers

19980011581 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK

Using Application Specific Knowledge for Configuring Object Replicas

Little, M. C., Newcastle-upon-Tyne Univ., UK; Shrivastava, S. K., Newcastle-upon-Tyne Univ., UK; Apr. 1997; 18p; In English
Report No.(s): PB97-179766; TRS-579; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In distributed systems, object replication is used to improve the availability and performance of applications in the presence of failures. When determining the configuration of a replicated object (i.e., number and location of replicas), a number of often conflicting factors need to be considered, e.g., the availability and performance requirements of the object. However, application specific knowledge about the objects, such as any inter-dependencies, is typically not accounted for. In many applications, this information can affect an object's availability. The authors have designed and implemented a replication sub-system allowing applications to control these aspects of replication. This system allows the efficient replication of an arbitrary number of objects with arbitrary inter-dependence.

NTIS

Distributed Parameter Systems; Fault Tolerance; System Failures; Configuration Management; Replicas

19980011583 Newcastle-upon-Tyne Univ., Center for Software Reliability, Newcastle, UK

SITE: A Statistics-Based Integrated Test Environment

Chu, H. D., Newcastle-upon-Tyne Univ., UK; Dobson, J. E., Newcastle-upon-Tyne Univ., UK; Apr. 1997; 29p; In English
Report No.(s): PB97-176671; TRS-584; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The paper presents a Statistics-based Integrated Test Environment, SITE, which supports statistics-based testing on the top of specification-based testing with two main issues in software testing, when to stop testing and how good the software is after testing. It provides automatic support for test execution by the test drive, test development by the SIAD/SOAD tree editor and the test data generator, test failure analysis by the test results validator, test measurement by the statistical analyst, test management by the test manager and test planning by the modeler. These tools are integrated around an object management system which includes a public, shared data model describing the data entities and relationships which are manipulable by the tools.

NTIS

Software Development Tools; Software Engineering; Computer Programs; Program Verification (Computers); Statistical Tests; Software Reliability

19980011585 Technische Univ., Information Systems Workgroup, Twente, Netherlands

Implementation Platforms for a High-Level Data Modelling Language

Skowronek, J., Technische Univ., Netherlands; Apers, P. M. G., Technische Univ., Netherlands; Blanken, H. M., Technische Univ., Netherlands; Wilschut, A., Technische Univ., Netherlands; Jun. 1996; 13p; In English

Report No.(s): PB97-204549; MEMO-INF-96-07; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the paper, the discrepancies are illustrated for a number of possible implementation platforms. Possible solutions for those mismatches are presented based on the example of the translation of a high-level data model TM to a number of platforms. In the translations, extensibility (represented for example by the possibility to redefine the type features) of the target platform was found to be the most important factor enabling semantically accurate translations.

NTIS

Object-Oriented Programming; Programming Languages; Translating; Computer Systems Design; Data Base Management Systems

19980011592 Helsinki Univ. of Technology, Inst. of Mathematics, Espoo, Finland

HypeMAT, a Basic Mathematics Selfstudy Package: Principles and Structure

Loimulahti, A., Helsinki Univ. of Technology, Finland; Kivelae, S. K., Helsinki Univ. of Technology, Finland; Sep. 1995; ISSN 0784-6460; 18p; In English

Report No.(s): PB96-169446; ISBN 951-22-2747-9; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

HypeMAT is a hypermedia based selfstudy package filling the gap between senior high school and university. The UNIX/X-Windows authorware system called MetaCard is utilized to design and build the package. The basic theory behind the learning package is discussed and the main structure and the use of the package is presented.

NTIS

UNIX (Operating System); Windows (Computer Programs); Multimedia; Instruction Sets (Computers); Computer Assisted Instruction

19980011595 Vrije Univ., Dept. of Computer Science, Amsterdam, Netherlands

Metric Predicate Transformers: Towards a Notion of Refinement for Concurrency

Bonsangue, M. M., Vrije Univ., Netherlands; deVink, E., Vrije Univ., Netherlands; Kok, J. N., Utrecht State Univ., Netherlands; Dec. 1994; 42p; In English

Report No.(s): PB96-168034; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

For two parallel languages with recursion a compositional weakest precondition semantics is given using two new metric resumption domains. The underlying domains are characterized by domain equations involving functors that deliver 'observable' and 'safety' predicate transformers. Further a refinement relation is defined for this domains and illustrated by rules dealing with concurrent composition. It turns out, by extending the classical duality of predicate vs. state transformers, that the weakest precondition semantics for the parallel languages is isomorphic to the standard metric state transformers semantics. Moreover, the proposed refinement relation on the predicate transformer domain will correspond to the familiar notion of simulation in the state transformer domain.

NTIS

Semantics; Logic; Programming Languages; Operators (Mathematics); Mathematical Models; Computer Programming; Simulation; Domains

19980011600 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK

Computing Science: Self-Taught Computer Engineering Course

Coleman, J. N., Newcastle-upon-Tyne Univ., UK; Kinniment, D. J., Newcastle-upon-Tyne Univ., UK; Burns, F. P., Newcastle-upon-Tyne Univ., UK; Koelmans, A. M., Newcastle-upon-Tyne Univ., UK; Mar. 1996; 11p; In English

Report No.(s): PB96-178397; TRS-546; Copyright Waived (NASA); Avail: CASI; A03, Hardcopy; A01, Microfiche

The application of computer-aided learning is still in its infancy in higher education. This paper examines some of the reasons for its slow uptake and then describes a project to develop courseware for a large proportion of the Electronic Engineering syllabus within several UK Higher Education Institutions. We describe the philosophy and design of this courseware, and then report a series of tests in which the examination performance of students using it was compared with that of control groups taught in traditional lectures. The results clearly suggest that carefully-designed courseware can lead to a large reduction in teaching time, with no significant difference in learning.

NTIS

Computer Assisted Instruction; Education

19980011627 Wisconsin Univ., Dept. of Computer Sciences, Madison, WI USA

The Use of Program Profiling for Software Maintenance with Applications to the Year 2000 Problem

Reps, Thomas, Wisconsin Univ., USA; Ball, Thomas, Wisconsin Univ., USA; Das, Manuvir, Wisconsin Univ., USA; Larus, James, Wisconsin Univ., USA; Jan. 1997; 18p; In English

Contract(s)/Grant(s): N000145-92-J-1937

Report No.(s): AD-A332295; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This paper describes new techniques to help with testing and debugging, using information obtained from path profiling. A path profiler instruments a program so that the number of times each different loop free path executes is accumulated during an execution run. With such an instrumented program, each run of the program generates a path spectrum for the execution; a distribution of the paths that were executed during that run. A path spectrum is a finite, easily obtainable characterization of a program's execution on a dataset, and provides a behavior signature for a run of the program. Our techniques are based on the idea of comparing path spectra from different runs of the program. When different runs produce different spectra, the spectral differences can be used to identify paths in the program along which control diverges in the two runs. By choosing input datasets to hold all factors constant except one, the divergence can be attributed to this factor. The point of divergence itself may not be the cause of the underlying problem, but provides a starting place for a programmer to begin his exploration. One application of this technique is in the Year 2000 Problem (i.e., the problem of fixing computer systems that use only 2 digit year fields in date valued data). In this context, path spectrum comparison provides a heuristic for identifying paths in a program that are good candidates for being date dependent computations. The application of path spectrum comparison to a number of other software maintenance issues is also discussed.

DTIC

Computers; Program Verification (Computers); Programmers

19980011668 Pennsylvania Univ., Dept. of Chemistry, Philadelphia, PA USA

Computer Simulations of Low Temperature High Energy Density Materials Final Report, 1 Apr. 1996 - 31 Mar. 1997

Voth, Gregory A., Pennsylvania Univ., USA; Mar. 31, 1997; 2p; In English

Contract(s)/Grant(s): F49620-96-I-0129; AF Proj. 2303

Report No.(s): AD-A332824; AFOSR-97-0720TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Solid hydrogen doped with energetic impurities may form the basis for High Energy Density Materials (HEDM) to be used in rocket propulsion. A key research priority was therefore the large-scale computer simulation of impurity diffusion and recombination in HEDM in order to better understand the reasons for its stability, or instability, as the case may be. The recombination of these atomic impurities is an extremely exothermic reaction, and therefore thermodynamically favored. Theoretical developments within our research group allowed for the (otherwise impossible) quantum dynamical simulation of these systems which was necessary to properly treat the problem. Classical molecular dynamics simulations, while less computationally challenging, predict qualitatively incorrect properties for low temperature liquid and solid hydrogen because of the highly quantum nature of hydrogen matrix, and are therefore inadequate.

DTIC

Computerized Simulation; Low Temperature; Density (Mass/Volume)

19980011881 Vigyan Research Associates, Inc., Hampton, VA USA

PIV/HPIV Film Analysis Software Package *Final Report*

Blackshire, James L., Vigyan Research Associates, Inc., USA; Dec. 1997; 20p; In English

Contract(s)/Grant(s): NAS1-19505; RTOP 538-03-12-04

Report No.(s): NASA/CR-97-206286; NAS 1.26:206286; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A PIV/HPIV film analysis software system was developed that calculates the 2-dimensional spatial autocorrelations of subregions of Particle Image Velocimetry (PIV) or Holographic Particle Image Velocimetry (HPIV) film recordings. The software controls three hardware subsystems including (1) a Kodak Megaplug 1.4 camera and EPIX 4MEG framegrabber subsystem, (2) an IEEE/Unidex 11 precision motion control subsystem, and (3) an Alacron I860 array processor subsystem. The software runs on an IBM PC/AT host computer running either the Microsoft Windows 3.1 or Windows 95 operating system. It is capable of processing five PIV or HPIV displacement vectors per second, and is completely automated with the exception of user input to a configuration file prior to analysis execution for update of various system parameters.

Author

Particle Image Velocimetry; Applications Programs (Computers); Software Engineering

19980011977 Naval Research Lab., Washington, DC USA

Model Checking Complete Requirements Specifications Using Abstraction

Rharadwaj, Ramesh, Naval Research Lab., USA; Heitmeyer, Constance, Naval Research Lab., USA; Nov. 10, 1997; 32p; In English

Report No.(s): AD-A331870; NRL/MR/5540--97-7999; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Although model checking has proven remarkably effective in detecting errors in hardware designs, its success in the analysis of software specifications has been quite limited. Model checking algorithms for hardware verification commonly use Binary Decision Diagrams (BDDs), a highly effective technique for analyzing specifications with the scores of Boolean variables commonly found in hardware descriptions. Unfortunately, BDDs are relatively ineffective for analyzing software specifications, which usually contain not only Booleans but variables spanning a wide range of data types. Further, software specifications have huge, often infinite, state spaces that cannot be model checked directly using conventional symbolic methods. One promising, but largely unexplored technique for limiting the size of the state space to be analyzed by model checking is to extract a model with a smaller state space from a complete specification using sound abstraction methods. Users of model checkers routinely analyze reduced models but most often generate the models in ad hoc ways. As a result, the reduced models are often incorrect. This paper first describes how one can model check a complete requirements specification expressed in the SCR (Software Cost Reduction) tabular notation. Unlike previous approaches which applied model checking to mode transition tables with Boolean variables, we use model checking to analyze properties of a complete SCR specification with variables ranging over many data types. The paper also describes two sound and complete methods for producing abstractions from requirements specifications. These abstractions are derived from the specification based on the property to be analyzed.

DTIC

Software Engineering; Program Verification (Computers)

19980011983 NERAC, Inc., Tolland, CT USA

Software Agents. (Latest citations from the INSPEC Database)

Nov. 1997; In English; Page count unavailable.

Report No.(s): PB98-850746; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning software technologies used to install autonomous intelligence in robots, robotic systems, and computers. References discuss vision technology, voice recognition systems; online adaptive control mechanisms; and broadband, neural, sensor, and multi-agent networks.

NTIS

Bibliographies; Computer Programs; Software Engineering

19980011999 Pennsylvania State Univ., Dept. of Statistics, University Park, PA USA

Fitting Optimal Piecewise Linear Functions Using Genetic Algorithms

Pittman, J., Pennsylvania State Univ., USA; Murthy, C. A., Pennsylvania State Univ., USA; Dec. 1997; 43p; In English

Contract(s)/Grant(s): DAAH04-96-1-0082

Report No.(s): AD-A332788; TR-97-24; ARO-35518.26-MA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Constructing a model for data in R(sup 2) is a common problem in many scientific fields, including pattern recognition, computer vision, and applied mathematics. Often, little is known about the process which generated the data or its statistical properties. For example, in fitting a piecewise linear model the number of pieces as well as the knot locations may be unknown. Hence the method used to build the statistical model should have few assumptions and yet still provide a model that is optimal in some sense. Such methods can be designed through the use of genetic algorithms. In this paper we examine the use of genetic algorithms to fit piecewise linear functions to data in R2. The number of pieces, the location of the knots, and the underlying distribution of the data are assumed to be unknown. We discuss existing methods which attempt to solve this problem and introduce a new method which employs genetic algorithms to optimize the number and location of the linear pieces. We prove theoretically that our method provides near-optimal functions and present the results of extensive experiments which demonstrate that the proposed method provides better results than existing spline based methods. We conclude that our method represents a valuable tool for fitting both robust and non-robust piecewise linear functions.

DTIC

Genetic Algorithms; Pattern Recognition; Statistical Distributions; Mathematical Models; Neural Nets

19980012003 Lockheed Martin Tactical Defense Systems, Manassas, VA USA

Canvas Knowledge Acquisition Guidebook, Version 2.0

Dec. 31, 1996; 184p; In English

Contract(s)/Grant(s): F19628-93-C-0130

Report No.(s): AD-A331567; STARS-PA29-AC01/001/01; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This guidebook describes the Canvas approach to systematic knowledge acquisition. Canvas synthesizes elements of two distinct methods: Scenario-Based Engineering Process (SEP) and Organization Domain Modeling (ODM). SEP provides knowledge acquisition methods and representation techniques. ODM provides a conceptual framework for data acquisition planning for the purposes of domain engineering. The guidebook incorporates extensive lessons learned from project experience in managing a large-scale knowledge acquisition effort in coordination with advanced technology development in the health-care domain.

DTIC

Software Engineering; Data Acquisition; Knowledge Based Systems; Manuals; Acquisition; Handbooks

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COMPUTER SYSTEMS

Includes computer networks and special application computer systems.

19980009087 Texas Univ., Dept. of Computer Science, Austin, TX USA

Massively Parallel LINPACK Benchmark on the Intel Touchstone DELTA and iPSC/860 Systems Progress Report

vandeGeijn, Robert A., Texas Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 57-67; In English; Also announced as 19980009083

Contract(s)/Grant(s): NSF CCR-88-09615; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

We describe an effort to implement the LINPACK Benchmark on two massively parallel distributed memory MIMD computers, the Intel iPSC/860 and DELTA Systems.

Author

Massively Parallel Processors; Memory (Computers); MIMD (Computers)

19980009088 Wisconsin Univ., Coll. of Engineering, Madison, WI USA

Parallelization of KIVA-2 on iPSC/860 Supercomputer

Yasar, Osman, Wisconsin Univ., USA; Gebbeken, Bernhard, Wisconsin Univ., USA; Rutland, Chris, Wisconsin Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 69-111; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

KIVA-2 was originally developed at Los Alamos National Laboratory for the numerical simulation of transient, chemically reactive fluid flows with sprays in two- and three-dimension. It was developed for applications of internal combustion engines, but its modularity and generality make it applicable to a wide variety of multidimensional problems in fluid dynamics. Its wide-use in the auto-industry and academia and the impact of massively parallel machines in the computational sciences has drawn our attention to the parallelization of such a computer code. When analyzed with FORGE, an optimization tool for iPSC/860, the unparallelized version of the code is found to be spending 70spatial mesh. Decomposition of these loops in one direction (z-direction)

seems favorable to the other directions in terms of the ease of modification and reduction of the communication overhead. Indications are also such that decomposition of the whole problem region produces a major communication overhead, leaving one with limiting the parallelization only to these major loops to achieve a satisfactory speedup. The parallel version of KIVA-2, now running on iPSC/860, achieves a speedup of two on four processors and a speedup of four on sixteen processors. The only communication between processors is the global concatenation of some vector quantities and this is all done using the system routines. Although one can further try to reduce the communication overhead presented by these global concatenation operations the fact that only 70 maximum speedups we can achieve according to the Amdahl's law.

Author

Chemical Reactions; Communication Equipment; Computer Programs; Internal Combustion Engines; Massively Parallel Processors; Modularity; Parallel Processing (Computers); Supercomputers

19980009089 Air Force Inst. of Tech., Dept. of Electrical and Computer Engineering, Wright-Patterson AFB, OH USA

Efficient Parallelization of Serial Programs for the Intel iPSC/2 and iPSC/860 Hypercubes

Work, Paul R., Air Force Inst. of Tech., USA; Lamont, Gary B., Air Force Inst. of Tech., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 113-126; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

This paper extends standard techniques in parallelization of serial code and introduces an efficient dynamic load balancing technique. Data and control decomposition techniques are discussed as well as a combination of these approaches. Conventional approaches to static and dynamic load balancing are also mentioned as an introduction. The inherent features of the iPSC/2 and iPSC/860 hypercube message passing system allow an improved dynamic load balancing technique to enhance the performance of a parallelized program. In a data decomposition, the data are divided among the nodes, and each node contains an entire copy of the program, and processes its part of the data. In a control decomposition, the various functions of the program are distributed to the nodes, and each node executes a different part of the program on the same set of data. Sometimes it is useful to use both data and control decompositions in a particular serial to parallel conversion. Such a scheme would have several groups of processors assigned to unique tasks, with the data divided among the groups as well. Thus, a pipelining effect could be realized. Static load balancing is where the division of labor is hard coded into the program, while with dynamic load balancing, the program itself actually determines how the work should be divided among the nodes. If the work is evenly distributed, processor idle time is reduced to a minimum, resulting in improved performance. The Intel iPSC/2 and the iPSC/860 hypercubes use a message-passing protocol which allows a sending node to store a short message (j 100 bytes) in a preallocated buffer, and continue on with the next portion of its code. This allows a slave node notify the master node that it is about to finish its current set of data (or task), and finish that processing while the next set of data (or task) is being sent by the master node. A ray tracing program in electromagnetic scattering simulation was chosen to implement a data decomposed, dynamically balanced conversion to the Intel iPSC/2 and iPSC/860 hypercubes. Initially, the program was implemented with static load balancing to get the data decomposition working, and then a dynamic load balancing algorithm was implemented. The static load balancing resulted in a fairly good distribution of work, and the dynamic load balancing further smoothed the division of labor. A major emphasis of the paper is the conceptual discussion of the general parallel decomposition process.

Author

Control Systems Design; Data Conversion Routines; Decomposition; Dynamic Loads; Electromagnetic Scattering; Hypercube Multiprocessors; Pipelining (Computers); Protocol (Computers); Ray Tracing

19980009090 Air Force Inst. of Tech., Dept. of Electrical and Computer Engineering, Wright-Patterson AFB, OH USA

New Computational and Communications Results on the Intel iPSC/860 with the Intel System Software Release 3.3

Work, Paul R., Wright Lab., USA; Lamont, Gary B., Wright Lab., USA; Norris, Richard, Wright Lab., USA; Hartrum, Thomas C., Wright Lab., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 127-139; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

This paper evaluates the performance of the Intel iPSC/860 Hypercube in two areas: computations and communications. In the computational area, the basics of a superscalar architecture are covered, and a brief discussion of the benefits of superscalar architectures is presented. The results of some benchmarking efforts for the iPSC/860 are given and compared to other results achieved elsewhere. In the area of communications, the time required to send messages under the new System Software Release 3.3 is given as a function of message size, and comparisons are made to the performance measured on the older system software. Differing path lengths and message sizes, as well as bi-directional communications are the major areas covered. The results of the computational and communications measurements are then used to evaluate the grain size for the iPSC/860 hypercube. Finally,

an anomaly which occurs when large numbers of messages are sent to a node is discussed. This anomaly was originally discovered in the old operating system, but is still evident in the Intel System Software Release 3.3.

Author

Hypercube Multiprocessors; Interprocessor Communication; Multiprocessing (Computers); Parallel Processing (Computers)

19980009092 Technische Univ., Inst. fuer Informatik, Munich, Germany

TOPSYS (TOols for Parallel SYStems): An Integrated Environment for Programming Parallel Systems

Bemmerl, Thomas, Technische Univ., Germany; Proceedingss of the 1991 Annual Users' Conference; Nov. 1991, pp. 157-207; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

TOPSYS is a first step toward simplifying the use and programming of scalable multiprocessor systems. Its current implementation is based on an iPSC/2 hypercube system with process (thread) oriented parallelism and coarse grain granularity. TOPSYS is an integrated and hierarchical tool environment which offers tools for specification, parallel debugging, performance analysis, visualization and animation, mapping, dynamic load balancing, and a number of additional elements. Some of these tools have been offered for other multiprocessor systems as isolated elements. New features of TOPSYS include: Use of heterogeneous and distributed monitoring techniques for the collection of runtime data. TOPSYS is a hierarchical system supporting portability to new multiprocessor systems, it offers expendability to new tools that will be developed in future steps of the project and furthermore TOPSYS supports a network-based development environment. The tools are integrated at different levels in order to shorten the development cycle for parallel applications. All interactive tools within TOPSYS offer a common graphical interface based on X-Windows to support ease of use.

Author

Heterogeneity; Hypercube Multiprocessors; Multiprocessing (Computers); Program Verification (Computers); Reliability Analysis; Windows (Computer Programs)

19980009097 Northrop Research and Technology Center, Palos Verdes Peninsula, CA USA

Domain Objects: A New Approach to Parallel Programming

Angus, Ian G., Northrop Research and Technology Center, USA; Proceedingss of the 1991 Annual Users' Conference; Nov. 1991, pp. 241-267; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Distributed memory computers have demonstrated great potential in terms of very high performance for relatively low hardware cost. Unfortunately, the cost of developing and maintaining software for these machines is extremely high. As a result, relatively few applications and programmers have been able to take advantage of these computers. We believe that the single most important cause of the programming difficulties is that the address space of the computer is visibly nonuniform. The programmer must explicitly account for the nonuniformity throughout the program. Why does this memory structure cause so many problems? Every algorithm is defined on some abstract domain. The practical effect of implementing an algorithm on a computer is to implicitly identify the domain of the algorithm with the computer's address space. The irregularities of the abstract application domain form an overlay on the computer's processors and memory. Unless the application's domain boundaries and the machine boundaries naturally coincide, the programming task can be difficult. Our approach to ameliorating this problem is to identify the concept of an algorithm's domain as being an explicit object in an application program. Within each 'domain object' we encapsulate the mapping of the domain onto processors and memory. The objects that are defined for that domain inherit the mapped parallelism of that domain. In this paper we will: Briefly describe the structure of a typical numerical application to motivate the need for domain objects. Describe how domain objects are used. Discuss the functionality that is needed to support the manipulation of domains as objects. Describe our implementation which is a runtime library written in C++. Discuss how domain objects might fit into the language framework of C++, in particular relating them to the concepts of scope and storage class. Describe the shortcomings of this method. Domain objects associate the computer's resources of memory and processors with what the programmer sees as the abstract domain of a task within his application. The actual memory nonuniformity is hidden by the domain objects and is invisible to the applications programmer. Since the details of memory allocation no longer appear, programs using domain objects will be simpler, more reliable, and portable.

Author

Distributed Memory; Encapsulating; Irregularities; Memory (Computers); Nonuniformity; Parallel Programming

19980009098 INTEL Corp., Supercomputer Systems Div., Beaverton, OR USA

3-D Life with X Windows and Hypertasking

Baber, Marc, INTEL Corp., USA; Proceedingss of the 1991 Annual Users' Conference; Nov. 1991, pp. 269-304; In English; Also announced as 19980009083

Contract(s)/Grant(s): MDA972-89-C-0034; ARPA Order 6402; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

This paper presents the results of a demonstration project for the hypertasking parallel compiler. Hypertasking converts sequential programs containing user supplied directives (that are embedded in comments) into SPMD parallel programs for iPSC multicomputers. The 3-D version of the game of Life was chosen as a demonstration program because the structure of the game is very similar to many grid-point applications in the physical sciences in that the majority of the work of the program is in a nested loop that iterates over a large array, calculating new element values from each element's neighbors. Such applications are well-suited to multicomputer architectures and hypertasking greatly simplifies the porting of these applications. In the hypertasked version of the 3-D Life game, each processor assigns a unique color to the living cells in its section of the 3-D array, so the display conveys both the results of the Life simulation and the decomposition strategy employed by the hypertasking run-time libraries. The parallel program also demonstrates the use of X window libraries on the nodes of an iPSC1860 hypercube. The added directives for hypertasking amount to approximately 50 lines out of the 1000-line program, so code overhead is a mere five percent.

Author

Computational Grids; Decomposition; Hypercube Multiprocessors; Multiprocessing (Computers); Windows (Computer Programs)

19980009099 INTEL Corp., Supercomputer Systems Div., Beaverton, OR USA

Using the X Window System with the iPSC/860 Parallel Supercomputer

Levine, David, INTEL Corp., USA; Kubaska, Ted, INTEL Corp., USA; Proceedingss of the 1991 Annual Users' Conference; Nov. 1991, pp. 305-320; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Using the X Window System on parallel MIMD supercomputers presents problems not normally encountered with serial machines. Parallel X programs have to deal with both X events and messages from other nodes, both of which may arrive asynchronously. A standard X program spends most of its time in an 'X event loop,' reacting to events such as key-presses and mouse-clicks. A parallel X program also needs to react to messages from other nodes, while still responding to X events quickly enough to remain interactive. This paper discusses different ways of using the X Window System with iPSC/860 node programs and presents several examples. One method, the Remote Host method, has a host program use the iPSC remote host software to receive messages from the nodes and graph the data. Another method, referred to as the Distinguished Node method and related to manager-worker problem decomposition, makes more efficient use of a parallel machine. In this method, one of the nodes accepts data from the other nodes and uses X client calls to communicate with a server over the Ethernet network. The remote host method is adaptable to other windowing systems, but the Distinguished Node method has significantly better graphics performance. The paper also discusses the limitations of other methods.

Author

Computer Networks; MIMD (Computers); Supercomputers; Windows (Computer Programs)

19980009103 Houston Univ., TX USA

Parallel Molecular Dynamics

Clark, Terry W., Houston Univ., USA; McCammon, J. Andrew, Houston Univ., USA; Scott, L. Ridgway, Houston Univ., USA; Proceedingss of the 1991 Annual Users' Conference; Nov. 1991, pp. 357-384; In English; 5th; SIAM Conference on Parallel Processing, USA; Also announced as 19980009083; Sponsored in part by Burroughs Wellcome Fund; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

We describe the results of a preliminary port of a large molecular dynamics (MD) code, gromos [15], to a distributed-memory parallel computer. The objectives of this study were three fold. First, we wanted to assess the suitability of our software tools [14] for porting existing FORTRAN codes (dusty decks). This involved developing FORTRAN versions of previously developed parallel extensions to the C programming language. Secondly, we wanted to be able to quantify various components of an MD simulation with respect to communication and computation costs. Here the objective was to have timing data that would aid in the design of a scalable code that could execute efficiently on a large number of processors. Finally, we wanted to see if execution speeds comparable to a Cray could be achieved easily with a modest number of current-generation nodes. Such performance seemed feasible based on a rough assessment of current processor performance and communication speed. One of our principal conclusions is that we were able to achieve performance on a standard benchmark problem comparable to reported performance of a

Cray-2 using between 8 and 16 processors on an iPSC/860. Moreover, this was done with a minimal amount of coding and debugging, due primarily to the use of our software tools.

Author

C (Programming Language); Cray Computers; Distributed Memory; Memory (Computers); Molecular Dynamics; Parallel Computers; Program Verification (Computers); Time Measurement

19980009105 NASA Ames Research Center, Moffett Field, CA USA

Intercube Communication for the iPSC/860

Barszcz, Eric, NASA Ames Research Center, USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 405-429; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Communication between multiple cubes on an Intel Hypercube is a desirable feature to facilitate the interdisciplinary problems that make up the grand challenge problems of the High Performance Computing and Communications Project (HPCCP). Intercube communication is also useful within a single discipline where the physical domain is broken into several computational domains. In both the single discipline and multiple discipline cases, cubes should be allocated that fit the size of individual domains. Currently, intercube communication can be implemented in three ways on an Intel Hypercube: individual cubes can communicate through the service resource module (SRM), via a shared file on the concurrent file system (CFS), or a user can allocate a cube large enough to hold all desired subcubes and manage subcube allocation and communication from within their code. All three methods have problems: communicating through the SRM or CFS is slow and having users manage their own subcubes places the burden of intercube communication on the users. In this paper, new communication primitives to handle intercube communication on an Intel Hypercube are proposed. They are currently being implemented on the 128 node Intel iPSC/860 located at NASA Ames. The function names are similar to existing names but typically require the destination cubename as an additional parameter. Communication is over the hypercube wires and so is approximately as fast as intracube communication. Overhead is due to the verification and validation of the destination cubename and node respectively.

Author

Communicating; Cubes (Mathematics); Hypercube Multiprocessors; Computer Conferencing; Information Management

19980009239 NERAC, Inc., Tolland, CT USA

Local Area Network Patents (Latest Citations from the US Patent Bibliographic File with Exemplary Claims)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869680; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning local area network (LAN) architectures and peripheral equipment. Selected patents are included for controllers, accessing methods, redundancy systems, and protocols. Cable devices and interfacing methods are also considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Local Area Networks; Bibliographies; Architecture (Computers)

19980009240 NERAC, Inc., Tolland, CT USA

Parallel Image Processing (Latest Citations from the INSPEC Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869672; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of parallel processing techniques in image analysis. Image recognition, enhancement, and synthesis, and the use of three-dimensional microelectronics in image analysis are among the topics considered. Hardware and software use in machine and robot vision is also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Image Processing; Parallel Processing (Computers); Bibliographies

19980009247 NERAC, Inc., Tolland, CT USA

Protocol Conversion (Latest Citations from the INSPEC Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-869086; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning protocol conversion methods and equipment used in data transmission and communication systems. Descriptions and evaluations of specific systems, network architecture considerations, and facsimile data conversion are among the topics discussed. Attention is given to the IBM 3270 environment. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Data Transmission; Communication Networks; Protocol (Computers); Data Conversion Routines

19980009291 Argonne National Lab., IL USA

Sharing visualization experiences among remote virtual environments

Disz, T. L., Argonne National Lab., USA; Papka, M. E., Argonne National Lab., USA; Pellegrino, M., Argonne National Lab., USA; Stevens, R., Argonne National Lab., USA; [1995]; 22p; In English; High Performance for Computer Graphics and Visualization Conference, 3-4 Jul. 1995, Swansea, UK

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): ANL/MCS/CP-91220; CONF-9507261-1; DE97-001011; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Virtual reality has become an increasingly familiar part of the science of visualization and communication of information. This, combined with the increase in connectivity of remote sites via high-speed networks, allows for the development of a collaborative distributed virtual environment. Such an environment enables the development of supercomputer simulations with virtual reality visualizations that can be displayed at multiple sites, with each site interacting, viewing, and communicating about the results being discovered. The early results of an experimental collaborative virtual reality environment are discussed in this paper. The issues that need to be addressed in the implementation, as well as preliminary results are covered. Also provided are a discussion of plans and a generalized application programmers interface for CAVE to CAVE will be provided.

DOE

Virtual Reality; Computerized Simulation; Computer Networks; Simulators; Real Time Operation

19980009617 NERAC, Inc., Tolland, CT USA

Online Transaction Processing. (Latest Citations from the Computer Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865126; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning business activity and market aspects of online transaction processing (OLTP). Topics include efforts by specific vendors as well as cooperative agreements among the major players, third-party software developments, and market projections. Some attention is given to descriptions of existing installed systems. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; On-Line Systems; Data Processing

19980009780 NERAC, Inc., Tolland, CT USA

Fiber Channel Interconnects (Latest Citations from the Computer Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-868591; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning a computer interconnect architecture referred to as the fiber channel standard. References focus on development of this standard, which allows for the interconnection of traditional hardware and high speed hardware. Comparisons are presented between fiber channel and other architectures including asynchronous transfer mode (ATM), token ring, and fiber distributed data interface (FDDI). Product applications are also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Architecture (Computers); Computers

19980009782 NERAC, Inc., Tolland, CT USA

Intranets (Latest Citations from the ABI/Inform Database)

Apr. 1996; In English; Page count unavailable

Report No.(s): PB96-858899; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning intranets. Special emphasis focuses on the relationship with the Internet. Topics include private networks, security, and new services and products. Internet/intranet marketing strategies are discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Computer Networks

19980009793 Carnegie-Mellon Univ., School of Computer Science, Pittsburgh, PA USA

Generating Code for High-Level Operations through Code Composition

Stichnoth, James A., Carnegie-Mellon Univ., USA; Aug. 1997; 135p; In English

Contract(s)/Grant(s): F30602-96-1-0287

Report No.(s): AD-A329934; CMU-CS-97-165; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

A traditional compiler translates each expression or statement in a high-level language into a sequence of lower-level target statements (e.g., operations in an intermediate representation, or machine instructions), in a manner fixed by the compiler writer. The output is then subject to further optimization. This compilation strategy is called custom code generation, as the compiler generates custom code for each input construct. An alternative strategy is to generate a call to a runtime library for each high-level language construct. This approach is attractive if the source language contains complex, powerful constructs, like the distributed array assignment statement in High Performance FORTRAN (HPF). The decision between custom code generation and use of a runtime library involves tradeoffs between efficiency (performance of the generated code), maintainability (ease of developing and maintaining the algorithm), and generality (implementation of the general case, rather than merely a simplified canonical case). I introduce a new compilation strategy, high-level code composition, which combines the advantages of custom code generation and runtime libraries. The compilation of each construct is controlled by code templates, which contain both target code to be generated and compile-time control instructions that specify how the templates are composed together. The templates are external to the compiler, making them easy to write and modify.

DTIC

Algorithms; Computer Programs; Compilers; FORTRAN; Libraries

19980009795 Rochester Univ., Dept. of Computer Science, NY USA

Lineal Feature Extraction by Parallel Stick Growing

Hunt, Galen C., Rochester Univ., USA; Nelson, Randal C., Rochester Univ., USA; Jun. 1996; 14p; In English

Contract(s)/Grant(s): N00014-93-I-0221; NSF CDA-94-01142

Report No.(s): AD-A329864; TR-625; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Finding lineal features in an image is an important step in many object recognition and scene analysis procedures. Previous feature extraction algorithms exhibit poor parallel performance because features often extend across large areas of the data set. This paper describes a parallel method for extracting lineal features based on an earlier sequential algorithm, stick growing. The new method produces results qualitatively similar to the sequential method. Experimental results show a significant parallel processing speed-up attributable to three key features of the method: a large numbers of lock preemptible search jobs, a random priority assignment to source search regions, and an aggressive deadlock detection and resolution algorithm. This paper also describes a portable generalized thread model. The model supports a light-weight job abstraction that greatly simplifies parallel vision programming.

DTIC

Linearity; Parallel Processing (Computers); Pattern Recognition

19980009877 NERAC, Inc., Tolland, CT USA

Bridges and Routers for Computer Networks. (Latest citations from the INSPEC Database)

Jun. 1996; In English; Page count unavailable.

Report No.(s): PB96-870985; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the routing and bridging technology used in computer network interconnection. The development and evaluation of routers and bridges for use in parallel architectures are examined. References review

online and networked information services, interconnecting LANs, service integration and operational flexibility, workstation clusters, optimal interconnection, fault diagnosis and fault tolerance, and self-routing.

NTIS

Computer Networks; Fault Tolerance; Information Systems; Local Area Networks; Workstations

19980009884 NERAC, Inc., Tolland, CT USA

Token Ring Networks: Market Assessment. (Latest Citations from the Computer Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866421; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning current market activities, and forecasting of token ring network utilization. IBM's token ring local area network (LAN) is discussed. IBM compatible products and systems are assessed, and comparisons with other LANs are briefly considered.

NTIS

Assessments; Forecasting; Local Area Networks; Market Research

19980010125 University of Southern California, Inst. for Robotics and Intelligent Systems, Los Angeles, CA USA

Scalable Data Parallel Algorithms and Implementations for Vision Final Report, 15 Sep. 1995 - 14 Mar. 1997

Nevatia, R., University of Southern California, USA; Prasanna, V. K., University of Southern California, USA; Jul. 08, 1997; 31p; In English

Contract(s)/Grant(s): F49620-95-I-0522

Report No.(s): AD-A332213; AFOSR-97-0668TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This effort is about designing, analyzing and implementing scalable and portable parallel solutions to problems in intermediate and high level vision. This is a difficult problem as computations are heterogeneous, symbolic and geometric in nature and use complex data structures such as lists and graphs. Simple data parallel approaches are not sufficient due to uneven distribution of symbolic features among the processors, unbalanced workload, and irregular interprocessor data dependency caused by the input image. In this work, a realistic model of distributed memory parallel machines which accurately models the features of a parallel machine was proposed. This includes the costs of communication latency, impact of communication patterns on network congestion, available bandwidth and time for synchronization. Using this model, the computation, communication and control characteristics and the memory requirements of the vision algorithms were analyzed. Based on these, an asynchronous parallel algorithm which enhances processor utilization and overlaps communication with computation by maintaining algorithmic threads in each processor was developed. Furthermore, the dynamic task migration technique at an algorithmic level can balance the unpredictable workload in parallelizing intermediate and high level vision problems.

DTIC

Computer Vision; Algorithms; Computation; Parallel Processing (Computers)

19980010338 NERAC, Inc., Tolland, CT USA

Fiber Optic Local Area Networks. (Latest Citations from the INSPEC Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865670; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of fiber optics technology in local area networks. Descriptions and evaluations of specific systems, protocols and topology, and switching are among the topics considered. Industrial applications such as manufacturing automation protocol, mining operations, and communications in factory operations are also discussed. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Fiber Optics; Local Area Networks

19980010560 NERAC, Inc., Tolland, CT USA

Integrated Service Digital Networks: Switching and Transmission (Latest Citations from the INSPEC Database)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863592; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning research, development, and economic aspects of integrated service digital networks (ISDN) used in public and private services. The citations examine architecture studies, implementation standards, transmission media characterizations of ISDNs, and data flow control. Packet, video, and optical switching are also considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Data Transmission; Computer Networks; Switching

19980010567 NERAC, Inc., Tolland, CT USA

Interfacing the Internet. (Latest Citations from the Microcomputer Abstracts Database)

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-858014; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the software and hardware required to interface with the Internet. Topics include accessing and navigating within the Internet in search of information. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Telecommunication; Internets

19980010575 NERAC, Inc., Tolland, CT USA

Computer Networks. (Latest Citations from the NTIS Bibliographic Database)

Mar. 1996; In English

Report No.(s): PB96-866389; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the development, evaluation, and applications of computer networks. Microcomputer-, supercomputer-, and transputer-based networks are discussed. Topics include computer communications, computer graphics, neural networks, network databases, distributed processing, computer information security, network interconnections, and communication protocols. Citations also cover applications in military and defense, telemetry, education, industrial process control, and mining. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Computer Networks

19980010922 ROI Joint Venture, Houston, TX USA

Toward a Context-Driven Model of WWW Navigation Final Report

Gerhart, Susan L., ROI Joint Venture, USA; Oct. 02, 1997; 49p; In English

Contract(s)/Grant(s): N00014-97-C-0108

Report No.(s): AD-A330171; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This research addresses problems of current World Wide Web (WWW) users by experimenting with alternative techniques for accessing and analyzing web information. The objective is to increase the productivity of web users and to improve their ability to find, qualify, and propagate high quality materials. The key idea of Browsing in Context is user managed alternative views of collections of web materials provide higher level insights on trends and patterns within the collections and improved direct interaction with abridged and full materials. Browsing in Context (BIC) offers a different approach to accessing and using WWW information content. Current browsers, commercial web utilities, and desktop computing systems do not adequately support several needs of WWW Information Professionals (librarians, journalists, market and policy analysts, research program trackers, etc.). Specifically lacking are information management and analysis tools for Topic Search Management, i.e. collecting and organizing large collections of URLs on specific subjects.

DTIC

Information Management; World Wide Web; Information Transfer; Information; Libraries; Policies; Productivity; Trends

19980010928 Carnegie-Mellon Univ., Dept. of Computer Science, Pittsburgh, PA USA

Spark 1998: Sparse Matrix Kernels for Shared Memory and Message Passing Systems

Oct. 08, 1997; 21p; In English

Contract(s)/Grant(s): F30602-96-I-0287; NSF CMS-93-18163

Report No.(s): AD-A331453; CMU-CS-97-178; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Spark98 is a collection of sparse matrix kernels for shared memory and message passing systems. Our aim is to provide system builders with a set of example sparse matrix codes that are simple, realistic, and portable. Each kernel performs a sequence of sparse matrix vector product operations using matrices that are derived from a family of three dimensional finite element earthquake applications. We describe the computational structure of the kernels, summarize their performance on a parallel system, and discuss some of the insights that such kernels can provide. In particular we notice that efficient parallel programming of sparse codes requires careful partitioning of data references, regardless of the underlying memory system. So on one hand, efficient shared memory programs can be just as difficult to write as efficient message passing programs. On the other hand, shared memory programs are not necessarily less efficient than message passing programs.

DTIC

Finite Element Method; Matrices (Mathematics); Memory (Computers); Parallel Programming

19980010965 Naval Postgraduate School, Monterey, CA USA

On the Role of the World Wide Web and Web Technology in Educational Courseware

Hester, James W., Jr., Naval Postgraduate School, USA; Moorman, Richard C., Naval Postgraduate School, USA; Mar. 1997; 252p; In English

Report No.(s): AD-A331739; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

There are many types of computerized training systems available today ranging from text-based "quizzers" to interactive multimedia "edutainment". However, each system is proprietary to the platform for which the binary executable is compiled. Additionally, when the information in the training material changes, a new copy must be created, distributed and installed before it is available to the end user. This thesis explores the use of the Java programming language as a fundamental element in the creation of interactive courseware deployable through the World Wide Web. Java is used to add interactive, executable content to Web pages in the form of simulations and complex demonstrations of educational concepts. Complete online materials were developed in support of the initial offering of CS2973, a Java programming course. Following that success, a prototype interactive online exam system, using a Java applet and file server, was developed. This prototype foreshadows a complete virtual classroom environment supported by a Courseware Creation Interface. Both of these have the distinct advantage of being cross-platform by virtue of being created in the Java programming language, thus usable on a majority of operating systems and platforms through Java-enhanced Web browsers.

DTIC

Education; Computer Techniques; World Wide Web; On-Line Systems; Programming Languages

19980012002 Naval Postgraduate School, Monterey, CA USA

Supporting Decision and Negotiation in an Internet Environment: An Experience with Negotiator/I

Blood, Kimberly S., Naval Postgraduate School, USA; Garcia, Joseph G., Naval Postgraduate School, USA; Mar. 1997; 102p; In English

Report No.(s): AD-A331719; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The purpose of this thesis is to explore implementation of decision support on the Internet. In particular it discusses four traditional decision making models. The information collected from these models will be applied to the creation of an Internet-based DSS. These models are the decision making model, problem solving model, creative thinking model, and the negotiation model. From an implementation point of view, this thesis develops a prototype decision support system for negotiation using Java. Realization of the prototype suggests that a decision support system (DSS) can be implemented using Java provided the DSS meets certain design parameters.

DTIC

Decision Support Systems; Internets

63

CYBERNETICS

Includes feedback and control theory, artificial intelligence, robotics and expert systems. For related information see also 54 Man/ System Technology and Life Support.

19980009095 Texas Univ., Computer Science Dept., Tyler, TX USA

HANS: An Interactive Neural Network System for Intel Supercomputers

Whitson, George M., Texas Univ., USA; Wu, Cathy, Texas Univ., USA; Taylor, John, Texas Univ., USA; Ermongkonchai, Adisorn, Texas Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 231-236; In English; Also

announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

The Hypercube Artificial Neural System is a menu driven system of neural networks that is being implemented on an Intel Hypercube.- Once the training and Identification files are prepared it is possible to use HANS with little or no programming. This LB very popular with the user community for whom the system was developed. Each learning algorithm has been developed to run in an optimal fashion on a Hypercube. Our current system has very general implementations of Back propagation and Hopfield with counter propagation and competitive learning planned for the future. Considerable attention has been paid to the design of the system to be sure it is maintainable and extensible.

Author

Hypercube Multiprocessors; Neural Nets; Supercomputers

19980009096 Texas Univ., Computer Science Dept., Tyler, TX USA

A New Implementation of the Hopfield Network on a Hypercube

Whitson, George M., Texas Univ., USA; Reddy, Sachinder, Texas Univ., USA; Kharat, Simon, Texas Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 237-240; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

A Hopfield network is one of the better known artificial neural systems. These networks have been used to solve problems in combinatorics, associative memory, and pattern recognition. Hopfield networks have been implemented on many types of computers, including most of the current parallel processors. In this paper we describe an implementation of the Hopfield network on an Intel Hypercube that can be made as close to perfectly parallel as is possible.

Author

Hypercube Multiprocessors; Neural Nets; Parallel Processing (Computers); Sorting Algorithms; Transputers

19980009851 Army War Coll., Carlisle Barracks, PA USA

Battlefield Robots for Army 21 Topical Report

Swinson, Mark L.; Jun. 1997; 60p; In English

Report No.(s): AD-A331848; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Robotics may well represent the greatest unfulfilled technological promise of the late twentieth century, and perhaps nowhere is this more true than in the area of military robotics. Closer examination of this issue suggests a compelling question. Is this failure due to technological immaturity or simply our collective inability (or unwillingness) to exploit technological opportunity? For this paper to be meaningful, I believe it is necessary to retain the distinction between descriptive analysis and prescriptive advice. As such, the paper begins with an historical perspective, followed by an analysis of the technologies relevant to military robotics. That done, we move on to look at some representative unmanned systems, followed by a projection beyond the Army XXI period of interest into the more distant future.

DTIC

Robots; Robotics; Technological Forecasting

19980009871 College of William and Mary, Williamsburg, VA USA

Improved Techniques for Modeling and Controlling Nonlinear Systems with Few Degrees of Freedom Final Report, 1 Apr. 1995 - 30 Sep. 1996

Tracy, E. R., College of William and Mary, USA; Brown, Reggie, College of William and Mary, USA; Dec. 19, 1996; 14p; In English

Contract(s)/Grant(s): F49620-95-I-0261

Report No.(s): AD-A332543; AFOSR-TR-97-677; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

New nonlinear signal processing and modeling techniques were examined. Three key issues formed the focus of the project 1. The incorporation of symmetries into the modeling process. Such symmetries might be deduced from fundamental principles, or inferred from observations. The incorporation of such symmetries leads to simpler, more robust models, with fewer free parameters. 2. The design of coupling terms for synchronizing the model with driving signals from the system of interest This is the first analytical result of its kind, and gives sufficient conditions for guaranteeing that the model will synchronize. 3. The successful use of symbolic time series analysis techniques to perform parameter estimation for spatiotemporal (distributed) systems. It was shown that the symbol statistics from a single site time series could be used for the parameter fitting even when the underlying system was turbulent.

DTIC

Nonlinear Systems; Lorentz Force; Technology Assessment; Models

19980009983 NERAC, Inc., Tolland, CT USA

Computerized Remote Control: Latest Citations from the Microcomputer Abstracts Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862917; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the implementation and operation of remote control computerized systems. Remote control hardware devices and software programs are reviewed. Uses in turning on and off equipment at remote sites, and dialing up and accessing information from remote computers are discussed. Other pertinent issues, such as computer virus detection and prevention, are also discussed.

NTIS

Bibliographies; Hardware; Computer Systems Programs; Computer Programs; Remote Control

19980009986 Yale Univ., Dept. of Electrical Engineering, New Haven, CT USA

Intelligent Control of Uncertain Systems Final Report

Morse, A. S., Yale Univ., USA; Jan. 1997; 7p; In English

Contract(s)/Grant(s): F49620-94-I-0181

Report No.(s): AD-A332017; AFOSR-97-0635TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This project has developed provably correct architectures and reconfiguring algorithms for controlling processes whose dynamical models may change drastically due to aging, component failure or other unpredictable events. With AFOSR support, the devising, testing and analysis of a provably correct, 'smart, high-level controller called a supervisor has been completed. The supervisor is capable of controlling the set-point of a very poorly modelled process by orchestrating the of switching a sequence of candidate, off-the-shelf, linear set-point controllers into feedback with the process. The provable features of the overall supervisory control system include robustness to unmodelled dynamics, noise and disturbances, as well as exponential convergence in the absence of noise. With the ultimate goal of extending these ideas to the supervision of families of nonlinear regulators, it has been shown that the any certainty equivalence control causes the familiar interconnection of a controlled process and associated output estimator to be detectable through the estimator's output error, for every frozen value of the index or parameter vector upon which both the estimator and controller dynamics depend. The concept of supervisory control has been successfully applied, both in simulations and in laboratory experiments, to the problem of auto-calibrating stereo-vision based system for driving a rigid mobile robot to a prescribed target.

DTIC

Error Analysis; Artificial Intelligence; Algorithms; Intelligence Tests; Control Systems Design

19980010039 Massachusetts Univ., Dept. of Electrical and Computer Engineering, Amherst, MA USA

Enabling Technologies for Real-Time Simulation Final Report, Sep. 1995 - Dec. 1996

Cassandras, Christos G., Massachusetts Univ., USA; Gong, Wei-Bo, Massachusetts Univ., USA; Aug. 1997; 105p; In English

Contract(s)/Grant(s): F30602-95-C-0242; AF Proj. 4594

Report No.(s): AD-A331846; RL-TR-97-77; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This report summarizes the work performed for Enabling Technologies for Real-Time Simulation. The objective was to develop and study a three-pronged approach for turning simulation into an effective setting for C31 application areas. In particular, the report describes research into: (1) concurrent simulation, for speeding up simulation experiments; (2) hierarchical simulation and specifically, preserving statistical fidelity in hierarchical decomposition activities; and (3) using Neural Networks as a method to extract a meta-model from the simulation.

DTIC

Technologies; Simulation; Real Time Operation; Computerized Simulation

19980010540 Brown Univ., Div. of Applied Mathematics, Providence, RI USA

Numerical Methods for Control of Large Complex Nonlinear Manufacturing Systems Final Report, 1 Sep. 1991 - 30 Sep. 1996

Kushner, Harold J., Brown Univ., USA; Jan. 23, 1997; 61p; In English

Contract(s)/Grant(s): F49620-91-I-0375

Report No.(s): AD-A332504; AFOSR-97-0604TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents codes for the numerical solution of control and optimal control problems for diffusion or reflected diffusion models in dimensions two to four and for continuous time Markov chain control problems where the state space of the chain is a grid in such a Euclidean Space. The control appears linearly in the dynamics and cost function but otherwise the process

and cost function are general. The underlying numerical methods use efficient forms of the approximation in policy space and multigrid type methods, based on the Markov chain approximation method of 7.

DTIC

Nonlinear Systems; Numerical Analysis; Optimal Control; Multigrid Methods; Markov Chains

19980010616 NERAC, Inc., Tolland, CT USA

Cellular Neural Networks. (Latest Citations from the INSPEC Database)

Mar. 1996; In English

Report No.(s): PB96-866371; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the architecture, design, analysis, implementation, and applications of cellular neural networks (CNNs). CNNs are information processing systems proposed by Chua and Yang in 1988. CNNs are cellular, analog, and multidimensional processing arrays with distributed logic and memory. Most applications are in the area of image processing, pattern recognition, and robot control. Topics include CNN simulators and paradigms, handwritten character recognition, automatic optical inspection, cellular automata, systems stability, universal machines and supercomputers, and automatic guided vehicles. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Neural Nets; Pattern Recognition; Image Processing

19980010828 Rutgers - The State Univ., Dept. of Mathematics, New Brunswick, NJ USA

Mathematical Theory of Neural Networks Final Report, 1 Aug. 1994 - 31 Jul. 1997

Sontag, Eduardo D., Rutgers - The State Univ., USA; Sussmann, Hector J., Rutgers - The State Univ., USA; Aug. 01, 1997; 41p; In English

Contract(s)/Grant(s): F49620-94-I-0293

Report No.(s): AD-A332338; AFOSR-97-0653TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report focuses on fundamental theoretical issues relevant to the capabilities, performance, and limitations of artificial neural networks. For static (feedforward) networks, subjects of investigation included the study of error surfaces for least squares fitting, VC and other learning dimensions, representability questions, and function approximation. For dynamic (recurrent) nets, covered are questions dealing with parameter identification and modeling, realizability and other systems-theoretic issues, theoretical computational capabilities, and learning-theoretic issues.

DTIC

Neural Nets; Artificial Intelligence

19980010943 Virginia Polytechnic Inst. and State Univ., Center for Applied Mathematics, Blacksburg, VA USA

The Air Force Center for Optimal Design and Control Final Report, 1 May 1993 - 30 Apr. 1997

Burns, John A., Virginia Polytechnic Inst. and State Univ., USA; May 29, 1997; 228p; In English

Contract(s)/Grant(s): F49620-93-I-0280

Report No.(s): AD-A332576; ICAM-97-06-01; AFOSR-TR-97-0630; No Copyright; Avail: CASI; A11, Hardcopy; A03, Microfiche

This report contains a summary and highlights of the research funded by the Air Force under AFOSR URI Grant F49620-93-I-0280, titled 'Center for Optimal Design and Control of Distributed Parameter Systems' (CODAC), for the period 1 May 1993 to 30 April 1997. The Center conducts a wide range of research and educational programs, and promotes linkages between Air Force Laboratories, industry and university scientists. During this four year period, CODAC researchers produced more than 150 scientific papers, made 160 presentations at conferences and colloquium and directed more than 33 graduate students. This research effort has produced several new mathematical algorithms for optimal design and control of fluid systems and a new solvability result for nonlinear hyperbolic systems. The effort in optimal design produced a revolutionary new approach for optimal design that combines continuous sensitivity equations with computational mathematics to greatly reduce design cycle time. This Sensitivity Equation Method has been transitioned into several commercial software packages and is the basis for continuing joint projects with industries throughout the USA. The effort in control of fluids and structures has produced two fundamental breakthroughs in the areas of distributed parameter actuator/sensor placement and in reduced basis methods for design of low order dynamic controllers for fluid/structure interactions. In addition, this report contains a summary of the interactions between Air Force facilities and industrial partners.

DTIC

Distributed Parameter Systems; Systems Engineering; Algorithms

19980010988 Maryland Univ., Lab. for Plasma Research, College Park, MD USA

Connectionists Models for Intelligent Computation Final Report, 15 Sep. 1992 - 14 May 1996

Chen, H. H., Maryland Univ., USA; Jun. 1996; 9p; In English

Contract(s)/Grant(s): F49620-92-J-0519

Report No.(s): AD-A332579; AFOSR-97-0606TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

We have successfully demonstrated the capability of neural net to learn the generation grammar and automata for discrete symbolic sequences. The first level of complexity is represented by the regular grammar and can be learned by a recurrent neural net. The capacity of these recurrent neural net to represent finite state machines that generate these regular grammar has also been theoretically estimated. In the next level of complexity, neural net was trained to operate a stack memory to recognize context free sequences. Finally, we showed that recurrent net can be constructed with a neural tape to represent a universal Turing machine. For continuous time series, we also showed that neural net can be used to classify curves with different topology, to control chaos system without pre-knowledge of its fixed points and to perform system identifications for real physical systems. For the last task, we have successfully trained a neural net to simulate the flight dynamics of a helicopter UH-60. The system used is a MIMO model of recurrent net. and the helicopter model has six degrees of freedom, the vertical, side and forward speed, the pitch rate, roll rate, yaw rate and four control maneuvers, the lateral longitudinal, directional and the collective controls.

DTIC

Neural Nets; System Identification

19980011598 Vrije Univ., Faculteit der Wiskunde en Informatica, Amsterdam, Netherlands

Relating Linear and Branching Time Temporal Models

Engelfriet, J., Vrije Univ., Netherlands; Treur, J., Vrije Univ., Netherlands; Aug. 1994; 44p; In English

Report No.(s): PB96-159967; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Temporal logic can be used to describe processes: the way in which they behave is characterized by a set of temporal models axiomatized by a temporal theory. Two types of models seem most useful for this purpose: linear and branching time models. A linear model describes one of the possible patterns of the reasoning process. In a branching time model, more possible patterns can be described, one for each branch of the model; at points where more than one continuation is possible a branching will occur. In the paper relations between these two different approaches are studied. The authors first define general temporal branching time and linear time models and look at a certain class of functions they call homomorphisms between models. A class of formulae which are persistent under these functions is identified. In order to define constructions needed to relate branching time models the authors look at categories satisfying a number of constraints and define (universal) notions in these categories. By showing the class of branching time models to be such a category they immediately inherit these notions. The notion of joint closure is used to construct a final model of a class of models. Using this they show that they can merge a set of linear models to a unique branching time model. Finally logical properties of the described universal (algebraic) constructions are studied.

NTIS

Artificial Intelligence; Temporal Logic

19980011626 Amherst Systems, Inc., Buffalo, NY USA

Fusion of Sensors That Interact Dynamically for Exploratory Development of Robust, Fast Object Detection and Recognition Final Report

Bandera, Cesar, Amherst Systems, Inc., USA; Peng, Jing, Amherst Systems, Inc., USA; Dec. 01, 1996; 73p; In English

Contract(s)/Grant(s): F49620-95-C-0072

Report No.(s): AD-A332211; AMHERST-621-9160006; AFOSR-97-0678TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Foveal vision simultaneously offers a wide field of view for better detection and central high acuity for better recognition; additionally, it is highly optimized and cost effective for time critical active vision applications. However, space variant data acquisition necessitates the development of gaze control techniques for demand driven allocation of resources to improve relevant information acquisition and the overall system performance. This report describes a commercially feasible, efficient reinforcement learning approach to gaze control for foveal machine vision. The report first lays a theoretical foundation for reinforcement learning. It then introduces particular reinforcement learning algorithms in conjunction with function approximation as an efficient learning control method for visual attention. The efficacy of the method is validated on a number of moderately complex target detection and active perception problems. by contrast, the substantial body of work on gaze control for active vision has not taken advantage of the power and flexibility of machine learning methods for visual attention. Finally, the report describes several experiments designed to evaluate the relative efficiency of various reinforcement learning algorithms and techniques for input generalization using both prediction and control problems. Computational results show that reinforcement learning with

neuro function approximation can be successfully used to obtain achievable gaze control performance in commercially feasible foveal machine vision products.

DTIC

Target Recognition; Artificial Intelligence; Computer Vision; Multisensor Fusion

19980011646 Naval Postgraduate School, Monterey, CA USA

Sonar-Based Localization of Mobile Robots using the Hough Transform

Latt, Khine, Naval Postgraduate School, USA; Mar. 1997; 77p; In English

Report No.(s): AD-A331465; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

For an autonomous mobile robot to navigate in an unknown environment, it is essential to know the location of the robot on a real-time basis. Finding position and orientation of a mobile robot in a world coordinate system is a problem in localization. Dead-reckoning is commonly used for localization, but position and orientation errors from dead-reckoning tend to accumulate over time. The objective of this thesis is to develop a feature-based localization method that allows a mobile robot to re-calibrate its position and orientation by automatically selecting wall-like features in the environment. In this thesis, the selection of features is accomplished by applying the Hough transform to sonar data. The Hough transform makes it possible to select the optimal feature (the longest wall, in this case) without finding all possible line segments from the sonar data. A least-square line fitting method is then employed to construct a model of the line segment that represents the feature selected by the Hough transform. The algorithm developed was tested using synthetic and real sonar data. Experimental results demonstrated the effectiveness of the proposed localization methods.

DTIC

Autonomous Navigation; Robots; Real Time Operation

19980011692 Clark Coll., Dept. of Computer Science, Atlanta, GA USA

Intelligent Fuzzy Controller for Satellite Ground Station Applications *Final Report, Sep. 1995 - Sep 1997*

George, Roy, Clark Coll., USA; Sep. 1997; 93p; In English

Contract(s)/Grant(s): F29601-95-K-0022; AF Proj. 8809

Report No.(s): AD-A332642; PL-TR-97-1119; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The Department of Computer Science at Clark Atlanta University investigated the use of genetic algorithms as a technique for automating the development of fuzzy logic controllers. The derivation of fuzzy controller rule-bases is relatively straightforward; however, the tuning of these controllers is a difficult process. In the first phase of this research, a genetic algorithm was used to tune the fuzzy controller. The genetic algorithm searches through the space of all membership functions to select the functions that produce the best control action. In the second phase of this project, the genetic algorithm was used to automatically derive the rule-base and membership functions. A full-featured research prototype was developed. The methodology and prototype were validated on typical control and classification problems. This research establishes a methodology for the rapid development of robust knowledge-based control systems in complex, poorly understood domains.

DTIC

Genetic Algorithms; Fuzzy Systems; Knowledge Based Systems; Controllers; Expert Systems; Classifications

19980011877 National Inst. of Standards and Technology, Gaithersburg, MD USA

PIECS: A Software Program for Machine Tool Process-Intermittent Error Compensation

Bandy, H. T., National Inst. of Standards and Technology, USA; Gilsinn, D. E., National Inst. of Standards and Technology, USA; Mar. 1996; 140p; In English

Report No.(s): PB96-165980; NISTIR-5797; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

This report documents software, called PIECS, that performs process-intermittent error compensation for a turning center. The program is a part of a larger three loop control architecture that includes a real-time geometric-thermal error compensation, loop and a post-process loop. In process-intermittent error compensation, a part is measured by on-machine gauging after a semi-finish cut which uses the same cutting parameters (speed, feed, and depth of cut) as are used in the finish cut, to reproduce process-dependent errors such as cutting-force induced tool or part deflection. During gauging a touch-trigger probe signal indicates that the part surface has been contacted. The coordinates of the points are then transformed to the part coordinate system and compared to the corresponding nominal coordinates so that errors may be determined. The error vector is defined as having its head at the measured coordinates of the gauged point and its tail at the nominal coordinate for that point. Since the philosophy chosen in this program is to compensate process-intermittent errors by changing the position and orientation of features, least squares curve fitting through the ends of the error vectors is used to determine the adjusted tool curve. The compensation curve becomes the tool path for the corresponding feature for the finish cut. The report includes a description of the program algorithm, the input and

output data sets as well as descriptions of each of the C-programming language functions that compose PIECS. A listing of the program is included in the appendix.

NTIS

Machine Tools; Position Errors; Real Time Operation; Computer Programs; Cutting; Actuators; Errors

64

NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

19980009086 ARCO Exploration and Production Technology, Plano, TX USA

Large-Scale Three-Dimensional Solutions of Hyperbolic Partial Differential Equations on the Intel iPSC/860

Hassanzadeh, Siamak, ARCO Exploration and Production Technology, USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 41-56; In English; Also announced as 19980009083; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Hyperbolic partial differential equations arise in many areas of science and engineering including structural vibrational analysis, earthquake seismology, underwater acoustics as well as seismic exploration. The computational requirements of numerical solutions of these equations for realistic large-scale three dimensional problems exceed the capabilities of most conventional computers. With the recent advances in parallel computation, it has now become feasible to solve these equations for large-scale cases. In this paper, a parallel method for the numerical solution of the three-dimensional scalar wave equation is presented. The method is based on finite difference approximation of the wave equation and its implementation on Intel iPSC/860 hypercube. Numerical results are presented to demonstrate the performance of the algorithm. by viewing the performance as a two-dimensional surface, in terms of speed up and sizeup, a more complete picture of performance is obtained. It is also shown that the performance of the method is highly dependent on computation to communication ratio.

Author

Computers; Earthquakes; Finite Difference Theory; Hyperbolic Differential Equations; Hypercube Multiprocessors; Seismology; Structural Analysis; Underwater Acoustics

19980009486 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Reduction of Normal Forms

Gaeta, G., Institut des Hautes Etudes Scientifiques, France; Jan. 1997; 7p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-141253; IHES/P/97/03; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The authors give an algorithm to simplify Poincare normal forms, making use of higher order effects; this leads to a simplification in the local study of nonlinear systems. The procedure is easily extended to the hamiltonian case and Birkhoff normal forms.

NTIS

Nonlinear Systems; Algorithms; Poincare Problem

19980009510 Commissariat a l'Energie Atomique, Dept. de Mecanique et de Technologie, Gif-sur-Yvette, France

MINOS: a nodal method; approximation by mixed dual finite elements in the Cronos code *La methode nodale de Cronos: MINOS, approximation par des elements mixtes duaux*

Lautard, J. J., Commissariat a l'Energie Atomique, France; May 1994; ISSN 0429-3460; 26p; In French

Report No.(s): CEA-N-2763; DE97-620933; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

This paper presents new extension for the mixed dual finite element approximation of the diffusion equation in rectangular geometry. The mixed dual formulation has been extended in order to take into account discontinuity conditions. The iterative method is based on an alternating direction method which uses the current as unknown. This method is fully "parallelizable" and has very quick convergence properties. Some results for a 3D calculation on the CRAY computer are presented.

DOE

Finite Element Method; Diffusion; Iterative Solution

19980009516 Rutherford Appleton Lab., Chilton, UK

Exploiting Zeros in Frontal Solvers

Scott, J. A., Rutherford Appleton Lab., UK; Aug. 1997; 17p; In English

Report No.(s): PB97-210447; RAL-TR-97-041; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

An important feature of the frontal method for the solution of large sparse systems of linear equations is that the frontal matrix is held as a dense matrix. This allows efficient dense linear algebra kernels, in particular, the Level 3 Basic Linear Algebra Subprograms (BLAS) to be used during the numerical factorization. However, the frontal matrix may contain a significant number of zeros being stored explicitly in the factors. In this paper we look at how we can take advantage of zeros within the frontal matrix. We illustrate the effects of exploiting zeros in the front on the factorization and solve times, and on the storage requirements for the Harwell Subroutine Library general frontal code MA42 using a range of problems arising from real engineering and industrial applications.

NTIS

Linear Equations; Matrices (Mathematics); Finite Element Method; Gaussian Elimination

19980009632 Naval Research Lab., Marine Meteorology Div., Monterey, CA USA

Three Dimensional Covariance Functions: Real Data Final Report, Oct. - Nov. 1996

Franke, Richard, Naval Research Lab., USA; Oct. 1997; 40p; In English

Report No.(s): AD-A332079; NRL/MR/7531-97--7232; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Height innovation data for a two-month period from NOGAPS was analyzed to obtain height prediction and observation error covariances. Different methods of weighting the data in least squares approximations were investigated using the second order autoregressive correlation function, both with and without an additive constant (varying with pressure level). Based on the properties of the derived covariance matrices and its parameters, the SOAR without an additive constant was used for the horizontal approximations. The vertical correlations were fit using a combination of SOAR plus and additive constant and a transformation of the log P coordinate to another coordinate to achieve a best fit. The resulting three dimensional approximation is partially separable, being the product of the horizontal covariance function (which depends on height) and the vertical correlation function. Figures demonstrate various aspects of the process and the results are given.

DTIC

Covariance; Functions (Mathematics); Three Dimensional Models

19980009633 Naval Research Lab., Monterey, CA USA

Three Dimensional Covariance Functions: Theory Final Report

Franke, Richard, Naval Research Lab., USA; Oct. 1997; 21p; In English

Report No.(s): AD-A332078; NRL/MR/7531-97--7231; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report discusses some approaches to three dimensional covariance function modeling, suited for innovation data from a numerical weather prediction model. The incorporation of a method using a simultaneous domain transformation and fit to the covariance data appears to be a useful method of generating nonhomogeneous covariance functions. Some preliminary experience is discussed, along with plans for follow-on work.

DTIC

Covariance; Functions (Mathematics); Three Dimensional Models

19980009651 NERAC, Inc., Tolland, CT USA

Discrete Fourier Analysis Theory and Applications. (Latest Citations from the NTIS Bibliographic Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866785; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning applications for discrete Fourier analysis. Consideration is given to the properties and effectiveness of discrete Fourier analysis, as well as methods of computation and generation of discrete Fourier transform pairs. Relationships between discrete Fourier transforms and fast Fourier transforms are also covered. Applications include frequency or spectrum analysis, solving linear equations, and performing multidimensional convolutions.

NTIS

Discrete Functions; Fast Fourier Transformations; Fourier Analysis; Fourier Transformation; Frequency Distribution; Spectrum Analysis

19980009775 California Univ., San Diego, Dept. of Mathematics, La Jolla, CA USA

Design of Robust Controllers: Frequency Domain Methods and their Non-Linear Extensions Final Report, 1 Apr. 1994 - 31 Mar. 1997

Helton, J. W., California Univ., San Diego, USA; Jun. 19, 1997; 13p; In English

Contract(s)/Grant(s): F49620-94-I-0185

Report No.(s): AD-A332385; AFOSR-TR-97-0656; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research concerns H-infinity control and focuses on substantially different parts of the subject, namely nonlinear systems, optimization theory and algorithms for frequency domain design and computer algebra tailored to systems and control research. For nonlinear plants, Helton-James made considerable progress on formulas for parameterizing all controllers. Also, for the very difficult measurement feedback problem they found a large class of 'singular controllers' which can actually be implemented. We established that they have excellent stable equilibria. Work on optimization integrated raw H-infinity methods with semidefinite programming algorithms. We expanded our computer algebra methods for reducing complicated sets of equations to nice sets of equations.

DTIC

H-Infinity Control; Control Systems Design; Nonlinear Systems

19980009783 Technische Univ., Eindhoven, Netherlands

Approximate Cyclic Reduction Multilevel Preconditioner for General Sparse Matrices

Reusken, A. A., Technische Univ., Netherlands; Oct. 1996; 24p; In English

Report No.(s): PB97-204911; RANA-96-20; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We discuss an iterative method for solving large sparse systems of equations. A hybrid method is introduced which uses ideas both from ILU preconditioning from multigrid. The resulting preconditioning technique requires the matrix only. A multilevel structure is obtained by using maximal independent sets for graph coarsening. For Schur complement approximation on coarser graphs, an incomplete Gaussian elimination is used. The resulting preconditioner has a transparent modular structure similar to the algorithmic structure of a multigrid V-cycle.

NTIS

Algorithms; Gaussian Elimination; Matrices (Mathematics); Approximation

19980009786 Technische Univ., Dept. of Mathematics and Computing Science, Eindhoven, Netherlands

Second-Order Subelliptic Operators on Lie Groups III: Hoelder Continuous Coefficients

ter Elst, A. F. M., Technische Univ., Netherlands; Robinson, D. W., Australian National Univ., Australia; Dec. 1996; 35p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-204952; RANA-96-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We discuss the hierarchy relating smoothness properties of the coefficients of H with smoothness of the kernel. Moreover, we establish Gaussian type bounds for the kernel and its derivatives.

NTIS

Kernel Functions; Lie Groups; Coefficients

19980009823 Technische Univ., Eindhoven, Netherlands

Heat Kernels and Riesz Transforms on Nilpotent Lie Groups

ter Elst, A. F. M., Technische Univ., Netherlands; Robinson, D. W., Australian National Univ., Australia; Sikora, A., Australian National Univ., Australia; Nov. 1996; 30p; In English

Report No.(s): PB97-204929; RANA-96-21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We consider pure m-th order subcoercive operators with complex coefficients acting on a connected nilpotent Lie group. We derive Gaussian bounds with the correct small time singularity and the optimal large time asymptotic behavior on the heat kernel and all its derivatives, both right and left. Further, we prove that the Riesz transform of all orders are bounded on the L-p-spaces with p is a member of the set (1, infinity). Finally, for second-order operators with real coefficients, we derive matching Gaussian lower bounds and deduce Harnack inequalities valid for all times.

NTIS

Lie Groups; Kernel Functions; Transformations (Mathematics); Inequalities; Coefficients

19980010011 Royal Inst. of Tech., Stockholm, Sweden

L(sup p)(L(sup infinity))- and L(sup 2)(L(sup 2))-Estimates for Oscillatory Fourier Transforms

Walther, B. G., Royal Inst. of Tech., Sweden; Jun. 1997; 10p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-209001; TRITA-MAT-1997-MA-23; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The purpose of this paper is to summarize some results on oscillatory Fourier transform given in earlier reports and to give some new results which are slight generalizations of what has already been obtained. The material presented is the documentation for a one hour invited lecture. Proofs are omitted and will appear elsewhere. In some cases we explain the underlying ideas.

NTIS

Fourier Transformation; Oscillations; Estimates

19980010012 Royal Inst. of Tech., Stockholm, Sweden

Optimal Growth of Functions with Bounded Laplacian

Karp, L., Royal Inst. of Tech., Sweden; Shagholian, H., Royal Inst. of Tech., Sweden; Jun. 12, 1997; 12p; In English
Report No.(s): PB97-209019; TRITA-MAT-1997-MA-24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Using a compactness argument, we introduce a Phragmen Lindelof type theorem for functions with bounded Laplacian. The technique is very useful in studying unbounded free boundary problems near the infinity point and also in approximating integrable harmonic functions by those that decrease rapidly at infinity. The method is flexible in the sense that it can be applied to any operator which admits the standard elliptic estimate.

NTIS

Boundary Value Problems; Free Boundaries; Harmonic Functions

19980010046 Technische Univ., Faculty of Technical Mathematics and Informatics, Delft, Netherlands

Computer Algebra System WAGRAM

Timochouk, L. A., Technische Univ., Netherlands; 1996; ISSN 0922-5641; 62p; In English
Report No.(s): PB97-204689; Rept-96-155; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

In the paper, we describe the design and implementation of our computer algebra system WAGRAM. The system is intended to perform heavy-duty computations of Groebner bases for polynomial ideals, and is written in Ada 95. In particular, an implementation of WAGRAM for shared-memory multi-processor architectures has been developed within the Ada 95 tasking paradigm. WAGRAM distribution contains a number of useful executables, but its main feature is to be a flexible set of libraries modifiable by the user.

NTIS

Ada (Programming Language); Algebra; Polynomials; Rings (Mathematics); Multivariate Statistical Analysis

19980010048 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Holomorphic Box Mappings

Graczyk, J., Michigan State Univ., USA; Swiatek, G., Pennsylvania State Univ., USA; Dec. 1996; 48p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-141014; IHES/M/96/76; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Box mappings were introduced as a tool for studying the dynamics of real unimodal polynomials. In the same paper, the main property of growing moduli was proved. This generalized earlier results obtained for certain ratios on the real line. In the paper, the authors present a more general result with a slightly different proof, not more complicated than the original proof of a weaker result. The generalization consists in allowing a large class of holomorphic box mappings without any connection with real dynamics. The result also generalizes the estimate used for the purpose of constructing quasiconformal conjugacies between quadratic polynomials, not necessarily real.

NTIS

Polynomials; Mapping; Proving

19980010522 NASA Langley Research Center, Hampton, VA USA

Equivalence of Fluctuation Splitting and Finite Volume for One-Dimensional Gas Dynamics

Wood, William A., NASA Langley Research Center, USA; Oct. 1997; 28p; In English

Contract(s)/Grant(s): RTOP 242-80-01-01

Report No.(s): NASA/TM-97-206271; NAS 1.15:206271; L-17677; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The equivalence of the discretized equations resulting from both fluctuation splitting and finite volume schemes is demonstrated in one dimension. Scalar equations are considered for advection, diffusion, and combined advection/diffusion. Analysis

of systems is performed for the Euler and Navier-Stokes equations of gas dynamics. Non-uniform mesh-point distributions are included in the analyses.

Author

Computational Fluid Dynamics; Navier-Stokes Equation; Finite Volume Method

19980010534 Texas Univ., Austin, TX USA

Interdisciplinary Symposium on Computational and Applied Mathematics Final Report

Oden, J. T., Texas Univ., USA; Sep. 17, 1997; 6p; In English

Contract(s)/Grant(s): DAAH04-95-I-0160

Report No.(s): AD-A332111; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Mathematical modeling, computer simulation, and numerical and computational mathematics have had a revolutionary influence on how scientific research is done. Every day new applications appear which demonstrate the dramatic increase in the role of computer simulation to model a variety of natural phenomena in order to both better understand them and to uncover new scientific principles and data. To explore these diverse topics, the need for interdisciplinary interaction and collaboration has become evident. These topics were the basis of an interdisciplinary symposium held at the University of Texas in April 1995. The symposium brought together leading researchers to assess the increasing opportunities in scientific research on computational mathematics and computer simulation, including mathematical modeling using numerical methods, high performance computing for large-scale applications, specialized applications in biology, environmental studies, numerical science, penetration mechanics, and wavelets and image processing together with the role of computer simulations in engineering analyses, manufacturing, and design.

DTIC

Computerized Simulation; Mathematical Models; Numerical Analysis; Wavelet Analysis

19980010814 Institute for Computer Applications in Science and Engineering, Hampton, VA USA

Numerical Computation of Sensitivities and the Adjoint Approach Final Report

Lewis, Robert Michael, Institute for Computer Applications in Science and Engineering, USA; Nov. 1997; 20p; In English; AFOSR Workshop on Optimal Design, 1997, Arlington, VA, USA; Sponsored by Air Force Office of Scientific Research, Bolling AFB, USA

Contract(s)/Grant(s): NAS1-19480; RTOP 505-90-52-01

Report No.(s): NASA-CR-206247; NAS 1.26:206247; ICASE-97-61; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We discuss the numerical computation of sensitivities via the adjoint approach in optimization problems governed by differential equations. We focus on the adjoint problem in its weak form. We show how one can avoid some of the problems with the adjoint approach, such as deriving suitable boundary conditions for the adjoint equation. We discuss the convergence of numerical approximations of the costate computed via the weak form of the adjoint problem and show the significance for the discrete adjoint problem.

Author

Numerical Analysis; Sensitivity; Adjoint; Boundary Value Problems

19980010846 Technische Univ., Twente, Netherlands

Reducing Quantization Error and Contextual Bias Problems in Object-Oriented Methods by Applying Fuzzy-Logic Techniques

Askit, M., Technische Univ., Netherlands; Marcelloni, F., Pisa Univ., Italy; Oct. 1996; 49p; In English

Report No.(s): PB97-204572; MEMO-INF-96-13; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

We consider two major problems, termed as quantization error and contextual bias problems, in the way how rules are defined and applied in current object-oriented methods. Firstly, two valued logic does not provide an effective means for capturing the approximate and inexact nature of a typical software development process. Secondly, the validity of a rule may largely depend on contextual factors such as the application domain, changes in user's interest and technological advances. The article has three contributions. Firstly, it introduces the notion and mathematical formulation of the quantization error problem which can be used to analyze, compare and improve current object-oriented methods. Secondly, a new fuzzy-logic based object-oriented software development technique is introduced to reduce quantization errors. Finally, the influence of contextual factors on rules is explicitly modeled and controlled by dynamically adapting the domain of contextual variables.

NTIS

Fuzzy Systems; Object-Oriented Programming; Software Engineering; Errors; Computer Programming

19980010896 Otago Univ., Dunedin, New Zealand

Proceedings of the Second Annual Conference: GeoComputation 1997

Aug. 29, 1997; 485p; In English; 2nd, 26-29 Aug. 1997, Dunedin, New Zealand

Report No.(s): AD-A286936; ERO-8263-EN-01; No Copyright; Avail: CASI; A21, Hardcopy; A04, Microfiche

The second GeoComputation Conference (GeoComp 97) and the 9th Annual Spatial Information Research Centre Colloquium (SIRC 97) have coalesced at Otago in 1997. It is an appropriate advance that the University of Leeds and the University of Otago combined these two events which are having an increasing impact on the geocomputing and spatial analysis communities. GeoComp 96 was held in Leeds and was a great success and 97 continues the tradition. The conference consists of over 40 research papers that are either presented orally or as a poster. All papers are printed in these proceedings and are available in a variety of electronic forms - namely CD and eventually on the conference web site. The themes that bind the conference are environmental modelling, artificial intelligence techniques, spatial modelling, integration of geographical analysis tools, cellular automata and visualisation. All these together form a compelling research area - geocomputing. The two additional outstanding themes - important for their predicted omnipresence are distributed environments and data analysis. These two alone will push the capabilities of geocomputing to the existing limits - and beyond.

DTIC

Conferences; Computation; Spatial Distribution; Geographic Information Systems

19980010937 Technische Univ., Twente, Netherlands

Asymptotics of Non-Laplacian Integrals

Brands, J. J. A. M., Technische Univ., Netherlands; Feb. 1997; 25p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-204614; RANA-97-03; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A non-Laplacian integral is an integral of which a complete asymptotic expansion can not be obtained by the so-called 'Method of Laplace'. A subclass of these non-Laplacian integrals is shown to have an asymptotic expansion in terms of (mostly) nonelementary functions. These functions pose new asymptotic problems which in many cases are easier to handle than the original problem.

NTIS

Asymptotic Series; Integrals; Series Expansion; Laplace Transformation

19980010940 Newcastle-upon-Tyne Univ., Dept. of Computing Science, Newcastle, UK

Axiomatisation of Duplication Equivalence in the Petri Box Calculus

Hesketh, M., Newcastle-upon-Tyne Univ., UK; Koutny, M., Newcastle-upon-Tyne Univ., UK; Apr. 1997; 41p; In English

Report No.(s): PB97-176663; TRS-585; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Petri Box Calculus (PBC) consists of an algebra of box expressions, and a corresponding algebra of boxes (a class of labelled Petri nets). There are several alternative ways of defining an equivalence notion for boxes, the strongest one being net isomorphism. In this paper, the authors consider the slightly weaker notion of equivalence, called duplication equivalence, which still can be argued to capture a very close structural similarity of concurrent systems the boxes are supposed to represent. The authors transfer the notion of duplication equivalence to the domain of box expressions and investigate the relationship between duplication equivalent boxes and box expressions. The main result of this investigation is a sound and complete axiomatization of duplication equivalence for a fragment of recursion-free PBC.

NTIS

Calculus; Petri Nets; Concurrent Engineering

19980010949 Texas Inst. for Computational Mechanics, Austin, TX USA

A New Cloud-Based hp-Finite Element Method

Oden, J. T., Texas Inst. for Computational Mechanics, USA; Duarte, C. A., Texas Inst. for Computational Mechanics, USA; Zienkiewicz, O. C., Texas Inst. for Computational Mechanics, USA; Dec. 1996; 22p; In English

Contract(s)/Grant(s): DAAH04-96-I-0062

Report No.(s): AD-A332134; TICAM-96-55; ARO-34482.4-MA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A hybrid computational method for solving boundary-value problems is introduced which combines features of the meshless hp-cloud methods with features of conventional finite elements. The method admits straightforward nonuniform hp-type approxi-

mations, easy implementation of essential boundary conditions, is robust under severe distortions of the mesh, and can deliver exponential rates of convergence. Results of numerical experiments are presented.

DTIC

Boundary Value Problems; Finite Element Method

19980010983 International Centre for Theoretical Physics, Trieste, Italy

Existence of parallel spinors on non-simply-connected Riemannian manifolds

McInnes, B., National Univ. of Singapore, Singapore; Apr. 1997; 10p; In English

Report No.(s): IC-97/36; DE97-635751; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

It is well known, and important for applications, that Ricci-flat Riemannian manifolds of non-generic holonomy always admit a parallel (covariant constant) spinor if they are simply connected. The non-simply-connected case is much more subtle, however. We show that a parallel spinor can still be found in this case provided that the (real) dimension is not a multiple of four, and provided that the spin structure is carefully chosen.

DOE

Riemann Manifold; Spinor Groups

19980010996 Technische Univ., Twente, Netherlands

Non-Self-Embedding Property for Generalized Fuzzy Context-Free Grammars

Asvelde, Peter R. J., Technische Univ., Netherlands; Aug. 1996; 19p; In English

Report No.(s): PB97-204556; MEMO-INF-96-08; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

In the paper, the authors study the effect of the non-self-embedding restriction on the generating power of fuzzy context-free K-grammars. The main result shows that under weak assumptions on the family K, a fuzzy language is generated by a non-self-embedding fuzzy context-free K-grammar if, and only if, either it is a fuzzy regular language or it belongs to the substitution closure $K(\text{sub infinity})$ of the family K. The proof heavily relies on the closure properties of the families K and $K(\text{sub infinity})$.

NTIS

Context Free Languages; Grammars; Embedding

19980011633 International Centre for Theoretical Physics, Trieste, Italy

Kac-Moody algebra is not hidden symmetry of chiral models

Devchand, C., International Centre for Theoretical Physics, Italy; Schiff, J., Bar-Ilan Univ., Israel; Jan. 1997; 6p; In English

Report No.(s): IC-97/5; Hep-th-9701059; DE97-634098; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

A detailed examination of the infinite dimensional loop algebra of hidden symmetry transformations of the Principal Chiral Model reveals it to have a structure differing from a standard centreless Kac-Moody algebra. A new infinite dimensional Abelian symmetry algebra is shown to preserve a symplectic form on the space of solutions.

DOE

Algebra; Symmetry; Mathematical Models

19980011635 Technische Univ., Delft, Netherlands

Construction of Orthogonal Polynomials Associated with Time Series and Random Fields

Janssen, R. H. P., Technische Univ., Netherlands; Nov. 07, 1995; 167p; In English

Report No.(s): PB96-173067; Copyright Waived; Avail: CASI; A08, Hardcopy; A02, Microfiche

Partial Contents: On Constructing Multivariate Orthonormal Polynomials, (Introduction, Orthonormal Polynomials, Constructing Orthonormal Polynomials); On Interpolating Random Fields using a Finite Number of Observations (Interpolation, Interpolation Polynomials, Gaussian Random Fields); On Orthonormal Matrix Polynomials and Kernel Polynomials (Orthonormal and Kernel Polynomials, Construction of Polynomials, Applications); An Interpolation Problem (Generating Function for dnm, Functional Convergence, Uniform Convergence, Hellinger Integrals).

NTIS

Multivariate Statistical Analysis; Time Series Analysis; Polynomials; Interpolation; Integrals

19980011662 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

An Empirical Examination of the Robustness of Arbitrage Factors

Howard, Randall B., Air Force Inst. of Tech., USA; Dec. 09, 1997; 154p; In English

Report No.(s): AD-A332783; AFIT-97-033D; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

After thirty years of vigorous research, there is still little agreement in the field of asset pricing theory. Shanken and Smith (1996) sum up the vast amount of empirical research on asset pricing models by saying, "Although we have learned much about the cross sectional and time series properties of returns and have developed sophisticated statistical methods to increase the power of the tests, numerous unanswered questions remain." Two of the most fundamental, yet unanswered, questions are: How many factors are there? and What are those factors? The two primary equilibrium, expected return models are the Capital Asset Pricing Model (CAPM), developed almost simultaneously by Sharpe (1964), Lintner (1965), and Mossin (1966), and the Arbitrage Pricing Theory (APT), introduced by Ross (1976, 1977). The CAPM is a one factor model that states that the equilibrium rate of return on any asset is a linear function of the asset's covariance with the market portfolio. The APT, on the other hand, is a multifactor model.

DTIC

Cost Analysis; Robustness (Mathematics); Time Series Analysis; Statistical Analysis

65

STATISTICS AND PROBABILITY

Includes data sampling and smoothing: Monte Carlo method; and stochastic processes.

19980009935 Pennsylvania State Univ., Center for Multivariate Analysis, University Park, PA USA

An Overall Test for Multivariate Normality

Rao, C. R., Pennsylvania State Univ., USA; Ali, Hydar, Pennsylvania State Univ., USA; Sep. 1997; 9p; In English

Report No.(s): AD-A332223; TR-97-21; ARO-35518.23-MA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

There are a number of methods in the statistical literature for testing whether observed data came from a Multivariate Normal (MVN) distribution with an unknown mean vector and covariance matrix. Let X_1, \dots be an iid sample of size n from a p -variate normal distribution. Denote the sample mean and sample variance-covariance matrix by \bar{X} and S respectively. Most of the tests of multivariate normality are based on the results that $(Y_{(i)} - S^{1/2}(X_{(i)} - \bar{X}))/n$, $i=1, \dots, n$, are asymptotically iid as p -variate normal with zero mean vector and identity covariance matrix. Tests developed by Andrews et al., Mardina and others are direct functions of $Y_{(i)}$. We note that the $N=np$ components of the Y_i 's put together can be considered as an asymptotically iid sample of size N from a univariate normal any well known test based on N independent observations for univariate normality. In Particular we can use univariate skewness and kurtosis tests, which are sensitive to deviations from normality.

DTIC

Multivariate Statistical Analysis; Normal Density Functions; Matrices (Mathematics); Variance (Statistics)

19980009949 Purdue Univ., Dept. of Statistics, West Lafayette, IN USA

Selecting the Most Reliable Poisson Population Provided It Is Better Than a Control: A Nonparametric Empirical Bayes Approach

Gupta, Shanti S., Purdue Univ., USA; Liang, TaChen, Purdue Univ., USA; Jul. 1997; 26p; In English

Contract(s)/Grant(s): DAAH04-95-I-0165

Report No.(s): AD-A332218; TR-97-9C; ARO-32922.12-MA; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We study the problem of selecting the most reliable Poisson population from among k competitors provided it is better than a control using the nonparametric empirical Bayes approach. An empirical Bayes selection procedure is constructed based on the isotonic regression estimators of the posterior means of failure rates associated with the k Poisson populations. The asymptotic optimality of the empirical Bayes selection procedure is investigated. Under certain regularity conditions, we have shown that the proposed empirical Bayes selection procedure is asymptotically optimal and the associated Bayes risk converges to the minimum Bayes risk at a rate of order $O(\exp(-cn))$ for some c greater than 0, where n denotes the number of historical data at hand when the present selection problem is considered.

DTIC

Regression Analysis; Bayes Theorem; Poisson Density Functions; Statistical Analysis

19980010936 Arizona State Univ., Tempe, AZ USA

Extensions to Regression Adjustment Techniques in Multivariate Statistical Process Monitoring

Hauck, Daryl J., Arizona State Univ., USA; Sep. 26, 1997; 158p; In English

Report No.(s): AD-A329727; Rept-97-025D; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

A common theme among the many existing multivariate statistical process monitoring (MSPM) methods is the recommendation that process knowledge be used to select a suitable monitoring procedure. Several methods possess the property of directional invariance, with shift detection performance depending only on the distance of a shift away from the target mean vector. This property is of special importance when characterizing a new process, or when available process knowledge suggests that shifts may occur in virtually any direction away from the target mean. In other cases, it is possible and may be desirable to increase a control scheme's sensitivity by using knowledge of the process structure and possible upset mechanisms to 'aim' the control procedure. This research identifies a potentially common MSPM scenario and extends the idea of using process knowledge to determine an appropriate control statistic for assignable cause detection and identification. Additionally, assumptions of normality and constant variance are imbedded in many statistical process monitoring procedures. For scenarios where monitoring with regression adjusted variables seems appropriate, but assumptions of normality and constant variance are violated, the use of prediction limits based on Generalized Linear Models theory was investigated and shown to be a potential improvement.

DTIC

Multivariate Statistical Analysis; Mathematical Models; Invariance; Regression Analysis; Control Theory; Least Squares Method

19980011516 Pennsylvania State Univ., Center for Multivariate Analysis, University Park, PA USA

Estimating the Number of Sinusoids and its Performance Analysis

Kundu, Debasis, Pennsylvania State Univ., USA; Dec. 1997; 16p; In English

Contract(s)/Grant(s): DAAH04-96-1-0082

Report No.(s): AD-A332777; TR-97-25; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Detecting the number of signals and estimating the parameters of the signals is an important problem in signal processing. Quite a number of papers appeared in the last twenty years regarding the estimation of the parameters of the sinusoidal components but not that much of attention has been given in estimating the number of terms presents in a sinusoidal signal. Fuchs developed a criterion based on the perturbation analysis of the data auto correlation matrix to estimate the number of sinusoids, which is in some sense a subjective-based method. Recently Reddy and Biradar proposed two criteria based on AIC and MDL and developed an analytical framework for analyzing the performance of these criteria. In this paper we develop a method using the extended order modelling and singular value decomposition technique similar to that of Reddy and Biradar. We use penalty function technique but instead of using any fixed penalty function like AIC or MAL, a class of penalty functions satisfying some special properties has been used.

DTIC

Monte Carlo Method; Sine Waves; Consistency; Signal Processing; Reliability Analysis; Autocorrelation; Matrices (Mathematics); Perturbation

19980011624 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Scheduling and Sequencing Arrivals to a Stochastic Service System

Bosch, Peter M., Air Force Inst. of Tech., USA; Oct. 1997; 270p; In English

Report No.(s): AD-A332136; AFIT-DS/ENS/97-03; No Copyright; Avail: CASI; A12, Hardcopy; A03, Microfiche

Optimization of scheduled arrival times to an appointment system is approached from the perspectives of both queueing and scheduling theory. The appointment system is modeled as a one-server, first-come-first-served, transient queue with independent, distinctly distributed service times and no-show rates. If a customer does show, it is assumed to be punctual. The cost of operating the appointment system is a convex combination of customers' waiting times and the server's overtime. While techniques for finding the optimal static and dynamic schedules of arrivals have been proposed by other researchers, they mainly have focused on identical customers and strictly punctual arrivals. This effort provides substantially more efficient solution methods, addresses a more general cost function, allows for no-shows and non-identical service distributions, and applies either when arrivals are constrained to lattice points or when they are unconstrained. Because customers are not indistinguishable, this effort also provides heuristics for determining optimal customer order. The effort concentrates on medical scheduling examples but is applicable to any appointment scheduling operation. Further, the proposed techniques apply to any convex, submodular function.

DTIC

Systems Analysis; Sequencing; Scheduling

19980011684 North Carolina Univ., Center for Stochastic Processes, Chapel Hill, NC USA

Research in Stochastic Processes and their Applications Final Report, 1995-1997

Kallianpur, Gopinath, North Carolina Univ., USA; Dasgupta, Amites, North Carolina Univ., USA; Mar. 31, 1997; 6p; In English

Contract(s)/Grant(s): F49620-95-I-0138; AF Proj. 2304

Report No.(s): AD-A332960; AFOSR-97-0676TR; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

During the project period, Ph.D. student Amites Dasgupta has been investigating "Fractional Brownian Motion: its Properties and Applications to Stochastic Integration".

DTIC

Stochastic Processes; Brownian Movements

19980011991 Brown Univ., Div. of Applied Mathematics, Providence, RI USA

Codes for Optimal Stochastic Control: Documentation and Users Guide

Jarvis, Dennis, Brown Univ., USA; Kushner, Harold J., Brown Univ., USA; May 1996; 58p; In English

Contract(s)/Grant(s): DAAH04-96-1-0075; AFOSR-91-0375; F49620-92-J-0081; NSF ECS-9302137

Report No.(s): AD-A332742; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report documents codes for the numerical solution of control and optimal control problems for diffusion or reflected diffusion models in dimensions two to four and for continuous time Markov chain control problems where the state space of the chain is a grid in such a Euclidean space. The control appears linearly in the dynamics and cost function but otherwise the process and cost function are general. The underlying numerical methods use efficient forms of the approximation in policy space and multigrid type methods, based on the Markov chain approximation method of 7.

DTIC

Markov Chains; Stochastic Processes; Approximation; Euclidean Geometry; Multigrid Methods; Numerical Analysis

66

SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

19980010035 Department of the Navy, Washington, DC USA

The Department of the Navy Benchmarking Handbook: A Systems View

Kraft, Joan, Department of the Navy, USA; Jan. 1997; 109p; In English

Report No.(s): AD-A332022; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Benchmarking is a strategic and analytic process of continuously measuring an organization's products, services, and practices against a recognized leader in the studied area (Department of the Navy TQL Glossary, 1996). Benchmarking is more than a simple comparison of one organization's business practices to another for the purpose of improving one's own process. Benchmarking provides a data-driven, decision-making vehicle to implement changes of world-class quality to core business practices. And, since there is no one way to perform a process that will be the industry's best practice forever, benchmarking is also an ongoing discovery process that recalibrates to establish new baselines for continuous improvement. Performed well, benchmarking will also promote teamwork and remove subjectivity from mission-critical decision making.

DTIC

Handbooks; Management Methods

67

THEORETICAL MATHEMATICS

Includes topology and number theory.

19980009084 Oak Ridge National Lab., Center for Computationally Intensive Physics, TN USA

Numerical Implementation of the Dirac Equation on Hypercube Multicomputers

Wells, J. C., Oak Ridge National Lab., USA; Umar, A. S., Vanderbilt Univ., USA; Oberacker, V. E., Vanderbilt Univ., USA; Botcher, C., Oak Ridge National Lab., USA; Strayer, M. R., Oak Ridge National Lab., USA; Wu, J.-S., Oak Ridge National Lab., USA; Drake, J., Oak Ridge National Lab., USA; Flanery, R., Oak Ridge National Lab., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 1-32; In English; Also announced as 19980009083

Contract(s)/Grant(s): DE-AC05-84OR-21400; DE-FG05-87ER-40376; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

Motivated by an interest in nonperturbative electromagnetic lepton-pair production in relativistic heavy-ion collisions, we discuss the numerical methods used in implementing a lattice solution of the time-dependent Dirac equation in three dimensional Cartesian coordinates. Discretization is obtained using the lattice basis spline collocation method, in which quantum-state vectors

and coordinate-space operators are expressed in terms of basis-spline Functions, and represented on a spatial lattice. All numerical procedures reduce to a series of matrix-vector operations which we perform on the Intel iPSC/860 hypercube multicomputer. We discuss solutions to the problems of limited node memory and node-to-node communication overhead inherent in using distributed-memory, multiple-instruction, multiple-data parallel computers.

Author

Cartesian Coordinates; Collocation; Dirac Equation; Distributed Memory; Education; Hypercube Multiprocessors; Matrices (Mathematics); Multiprocessing (Computers); Parallel Computers

19980009254 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Differential Topology in Dimension 3+1: (A Preliminary Version of Section 1)

Poenaru, V., Institut des Hautes Etudes Scientifiques, France; Mar. 1996; 29p; In English

Report No.(s): PB96-186432; IHES/M/96/18; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Let $\Delta^{(4)}$ be a smooth compact bounded 4-manifold, which is geometrically simply-connected at long distance. Then the open manifold, $X^{(4)}$ is the intersection of $\Delta^{(4)}$ (number sign) infinity (number sign) $(S^{(2)} \times D^{(2)})$ (where the infinite connected sum is taken along the boundaries) admits a smooth PROPER handlebody decomposition without handles of index $\lambda = 1$.

NTIS

Manifolds (Mathematics); Topology; Mapping

19980010984 International Centre for Theoretical Physics, Trieste, Italy

Diagonalization of coupled scalars and its application to the supersymmetric neutral Higgs sector

Diaz, M. A., Valencia Univ., Spain; May 1997; 25p; In English

Report No.(s): IC-96/252; IFIC-97/27; DE97-635750; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

We introduce a momentum dependent mixing angle $(\alpha)(p^{(2)})$ which allow us to diagonalize at any external momentum p the one-loop corrected inverse propagator matrix of two coupled scalar fields while keeping the full momentum dependence in the self energies. We compare this method with more traditional techniques applied to the diagonalization of coupled scalars at the one-loop level. This method is applied to the CP-even Higgs sector of the Minimal Supersymmetric Model, defining the momentum dependent mixing angle $(\alpha)(p^{(2)})$, and calculating the two CP-even Higgs masses and the mixing angle at these two scales. We compare the results obtained in this way with alternative techniques. We make explicit the relation between $(\alpha)(p^{(2)})$ and the running mixing angle. We find differences between the mixing angle calculated with our method compared with more traditional methods, and these differences are relevant for Higgs searches at LEP2.

DOE

Supersymmetry; Coupled Modes; Scalars; Higgs Bosons; Models; Invariance

70

PHYSICS (GENERAL)

For precision time and time interval (PTI) see 35 Instrumentation and Photography; for geophysics, astrophysics or solar physics see 46 Geophysics, 90 Astrophysics, or 92 Solar Physics.

19980009536 European Research Office (US Army), London, UK

Nanostructures: Physics and Technology International Symposium

Jun. 1997; 600p; In English; Nanostructures: Physics and Technology International Symposium, 23-27 Jun. 1997, Saint Petersburg, Russia

Report No.(s): AD-A328944; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

This report contains a compilation of Russian research reports on Nanostructures: physics and technology.

DTIC

Quantum Wells; Resonant Tunneling; Energy Gaps (Solid State)

19980009727 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Gravity, Equivalence Principle and Clocks

Damour, Thibault, Institut des Hautes Etudes Scientifiques, France; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 13-21; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

String theory suggests the existence of gravitational-strength scalar fields ('dilaton' and 'moduli') whose couplings to matter violate the equivalence principle. This provides a new motivation for high precision clock experiments, as well as a generic theoretical framework for analyzing their significance.

Author

String Theory; Gravitational Fields; Field Theory (Physics); Grand Unified Theory; Unified Field Theory; Clocks; Equivalence

19980009728 Purdue Univ., Dept. of Physics, West Lafayette, IN USA

Gravitation Physics and a Space Clock Mission

Haugan, Mark P., Purdue Univ., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 23-27; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Inspired by developments in the technology of trapped-ion atomic frequency standards that promise to decrease the cost of a space clock mission significantly, we review some of the gravitation physics which motivates such a mission. The focus here is on physics that can be probed during a mission's initial phase, while the clock is in Earth orbit. John Armstrong discusses the significance of searches for low-frequency gravitational waves that can be conducted during a second mission phase later in these proceedings.

Author

Conferences; Atomic Clocks; Gravitation; Technologies

19980010758 Washington Univ., Materials Science and Engineering Dept., Seattle, WA USA

Hysteresis Loops and Barkhausen Effects in Magnetic Materials

Ferguson, Luke, Washington Univ., USA; Stoebe, Thomas, Washington Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 239-254; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The objectives of the paper are to understand the phenomenon of magnetization in ferromagnetic materials by performing experiments and building apparatus for listening to the effect of the motion of magnetic domain walls and for graphically displaying magnetization curves. Students may perform simple processing experiments that drastically alter the magnetic properties of the materials being observed. Scientists and engineers use three vector quantities to describe the physics of magnetism. The magnetic field strength, symbol H , is associated with true currents only. True currents are the electrical currents carried in wires, and we are able to exert direct control over this type of current. The second vector quantity is called magnetization, symbol M , and this vector is associated with magnetization currents only. The simplest approach to magnetization currents is the picture of a particle such as an electron spinning about its axis, where the spinning charge can be viewed classically as being made up of infinitesimal current loops. The third magnetic vector is called magnetic induction, symbol B , and this magnetic vector is associated with both true currents and magnetization currents.

Derived from text

Hysteresis; Ferromagnetic Materials; Experimentation; Magnetic Properties; Domain Wall; Images; Loops

19980010767 Spiegel Designs, Baltimore, MD USA

A Magnetic Dilemma: A Case Study

Spiegel, Xavier F., Spiegel Designs, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 327-328; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

A scrap yard was having difficulty distinguishing between ALNICO and materials such as SS 410 and tool steels using a magnetic test. ALNICO is a permanent magnet, whereas materials such as SS 410 and tool steels are attracted to a magnet, but not normally permanent magnets. ALNICO is considerably more valuable than the 400 series of stainless steels and tool steels. The 300 series of stainless steels is considered non-magnetic, that is they are not attracted to a magnet, and are also considerably more valuable than the 400 series stainless steels and tool steels. In a scrap yard just about everyone carries a small magnet which is used to sort the magnetic materials, which in their jargon means attracted to a magnet, and non-magnetic materials, which again in their jargon means not attracted to a magnet. An employee noticed that some of the material which was supposed to be magnetic was actually attracting other materials in the bin and questioned his supervisor about this problem. The supervisor realized that ALNICO was that mysterious material and presented the problem to the Johns Hopkins University Center for Materials Research

under the ISIS/JHU Scrap Metal Research Program. The solution to this problem should not cost more than \$25.00, should require a minimum of training and be durable.

Author

Magnetic Materials; Scrap; Stainless Steels; Permanent Magnets; Durability; Costs

19980011875 Institute of Sound and Vibration Research, Southampton, UK

Institute of Sound and Vibration Research Annual Report, 1997

1997; 110p; In English; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Topics considered include: fluid dynamics and acoustics; human sciences; signal processing and control; structural dynamics; vehicle dynamics; teaching; consultancy; and appendices.

Derived from text

Dynamic Response; Dynamic Structural Analysis; Vibration

71 ACOUSTICS

Includes sound generation, transmission and attenuation. For noise pollution see 45 Environmental Pollution.

19980009318 Norwegian Defence Research Establishment, Kjeller, Norway

Spectrum Analysis of Ship Acoustic Noise

Nilssen, Ashild Bergh, Norwegian Defence Research Establishment, Norway; Sep. 16, 1997; 16p; In English; Original contains color illustrations

Contract(s)/Grant(s): FFIU Proj. 693/132

Report No.(s): FFI-97/04293; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Bispectral analysis of about 30 ships have been carried out. The bispectra of ship acoustic noise display a few significant peaks in the 0-100 Hz range. These peaks changes in frequency (and to a minor degree in level) as the operational conditions of a ship are varied. In contrast to the power spectrum is the size of the ship not reflected in the bispectrum.

Author

Ships; Noise (Sound)

19980009635 Woods Hole Oceanographic Inst., MA USA

Long Range Acoustic Communication Based on Optimal Waveform Design Final Report

Freitag, Lee, Woods Hole Oceanographic Inst., USA; Sep. 1997; 49p; In English

Contract(s)/Grant(s): MDA972-95-I-0006

Report No.(s): AD-A331857; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Acoustic communications for long-range underwater applications is made difficult by a number of environmental factors. The most important of these in shallow water propagation is the effect of the large number of ray paths that are observed after the sound travels from the source to the receiver. The summation of these rays at the receiver causes constructive and destructive interference, resulting in spectral shaping that varies over both time and space. The time spread of the channel, which can range from several milliseconds to a large fraction of a second, is the most difficult effect to overcome as the range from the source to the receiver increases. However, given that a phase-coherent system is optimal for maximizing through-put, one can focus on development of the receiver algorithm. In this paper the shallow water channel is first examined and found to have significant time spread over a narrow spread of arrival angles. Next the equalization algorithm is discussed, in particular, aspects which are important for the complex long range shallow water channel.

DTIC

Underwater Communication; Shallow Water; Acoustics

19980009991 Woods Hole Oceanographic Inst., Dept. of Applied Ocean Physics and Engineering, MA USA

Acoustic Scattering for Buried Objects at High Frequencies: A Ray Theoretic Approach Final Report, 1 Jan. 1995 - 31 Dec. 1996

Rajan, Subramnaia D., Woods Hole Oceanographic Inst., USA; Oct. 08, 1997; 9p; In English

Contract(s)/Grant(s): N00014-95-I-0407

Report No.(s): AD-A330858; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goals of the proposed research were as follows: (1) Develop a stochastic model that can be used to determine the presence of a buried object in ocean sediments, and (2) Develop a method for obtaining the bottom properties from analysis of normal incidence data as in the case of chirp sonar.

DTIC

Acoustic Scattering; Sediments; Sonar; Stochastic Processes

19980010017 Georgia Tech Research Inst., Atlanta, GA USA

Determination of Acoustic Parameters of Navy Coatings *Annual Report, 16 Oct. 1996 - 15 Oct. 1997*

Jarzynski, Jacek, Georgia Tech Research Inst., USA; Caille, Gary, Georgia Tech Research Inst., USA; Doane, John, Georgia Tech Research Inst., USA; Oct. 13, 1997; 10p; In English

Contract(s)/Grant(s): N00014-96-I-0175

Report No.(s): AD-A330057; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Currently there are three technical objectives: (1) Determination of the complex elastic moduli of the material over a large sample of the material. These moduli are a direct indication of the quality control of the Special Hull Treatments (SHT) production and application. They are also fundamental indicators of the acoustic performance of the treatment. As part of this measurement task, the feasibility of applying this technique to the shipyard quality assurance environment and to a laboratory scenario for investigation and characterization of commercial coating supplied by NAVSEA 92RC1 should be investigated. (2) Adaptation of the same system for detection of localized inclusions or discontinuities. It is believed that this technique could be used for analysis of seam integrity also. It is thought that this technique could be expanded for use on-site in a shipyard during application of the coating. This would allow for more timely analysis of the performance of the coating over a greater portion of the total surface of the vessel. (3) Extension of the above technique to make approximate measurements of the reflection coefficient of stress waves at the coating-hull interface. This reflection coefficient should be a direct measure of the local adhesion of the coating to the hull.

DTIC

Protective Coatings; Hulls (Structures); Acoustic Properties; Modulus of Elasticity

19980010813 Naval Postgraduate School, Monterey, CA USA

Investigation of a Constricted Annular Acoustic Resonator

Choeu, Seok Y., Naval Postgraduate School, USA; Jun. 1997; 88p; In English

Report No.(s): AD-A331952; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

One topic of current interest in thermoacoustic research is an annular prime mover Lin et al., J. Acoust. Soc. Am, 100, 2846 (1996). The starting point for this research is an investigation of a constricted annular resonator. A literature search of the field resulted in surprisingly few references. The results of analytic, numerical, and experimental investigations are presented. Introducing a constriction into an annular resonator splits each longitudinal duct mode into two modes, one of a higher frequency with a pressure antinode at the constriction and one at a lower frequency with a velocity antinode near the constriction. The lower mode is more sensitive to changes in the length and porosity of the constriction than the higher mode. Overall agreement between measured and predicted mode shapes and resonance frequencies is very good. It was found that it is necessary to include end corrections at the constriction to get accurate agreement between measured and predicted results.

DTIC

Experimentation; Resonators; Acoustic Resonance

19980010866 Naval Postgraduate School, Monterey, CA USA

Acoustic Motion Estimation and Control for Autonomous Underwater Vehicles

Celebioglu, Hakki, Naval Postgraduate School, USA; Jun. 1997; 104p; In English

Report No.(s): AD-A331728; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

An integrated model of acoustic motion estimation and control is presented. The control system is designed on the basis of the definitions of suitable Lyapunov functions for the different maneuvers in approaching a target. These functions allow the navigation and maneuvering tasks to be performed in a two-layered hierarchical architecture for closed-loop control. The motion estimation algorithm uses pencil beam profiling sonar range and bearing information. The operating environment is modeled with a suitable three-dimensional potential function and its gradient which forms an attractive field. This algorithm provides satisfactory performance for autonomous navigation and obstacle avoidance. The applicability and robustness of this model are demon-

strated with both actual test data obtained with the NPS Phoenix submersible and computer generated simulation data. The results show the effectiveness of the combined estimation and control model.

DTIC

Autonomous Navigation; Computerized Simulation; Underwater Vehicles; Pencil Beams; Sonar; Liapunov Functions; Feedback Control; Algorithms

19980010895 Department of the Navy, Washington, DC USA

Noise Coding Processor

Garcia, Joseph P., Inventor, Department of the Navy, USA; Aug. 25, 1997; 39p; In English

Patent Info.: US-Patent-Appl-SN-934012

Report No.(s): AD-D018619; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A noise coding processor employing pipeline processing techniques is disclosed. The noise coding processor employs parallel pseudo-random number sequence generation to generate multi-dimensional fields of pseudo-random sequences. The noise coding processor is particularly suited for use in pattern recognition applications and accepts signals representing feature correlations as inputs and derives a pattern to test the feature coherence therefrom.

DTIC

Pipelining (Computers); Pattern Recognition

19980010915 National Defence Research Establishment, Dept. of Guidance and Control, Materials and Underwater Sensors, Stockholm, Sweden

Spatio-Temporal Weighting for High Resolution Direction-of-Arrival Estimation *Topical Report Rums-Tidsviktning foer Hoegupploesande Estimering av Ankomstriktning*

Robinson, J. W. C., National Defence Research Establishment, Sweden; Nov. 1996; ISSN 1104-9154; 59p; In English

Report No.(s): PB97-143465; FOA-R-96-00319-2.2-SE; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

A new spatio-temporal weighting scheme for high resolution direction-of-arrival (DOA) estimation of narrow-band, possibly multi-frequency, signals is proposed. It works on correlation data rather than directly on output data, as in the beamspace methods, and incorporates forward-backward smoothing. By using a band-Toeplitz structure on the weighting matrix, it is possible to equivalently represent the effect of the weighting applied to the signal output correlation matrix as a weighting directly on the source correlation matrix. Numerical simulations are provided to illustrate the advantages with the proposed scheme.

NTIS

Weighting Functions; Signal Processing; Sonar; Sound Localization; Space-Time Functions

19980011660 Massachusetts Inst. of Tech., Dept. of Engineering, Cambridge, MA USA

Optimal Ocean Acoustic Tomography and Navigation With Moving Sources

Deffenbaugh, Max, Massachusetts Inst. of Tech., USA; Jun. 1997; 157p; In English

Report No.(s): AD-A331756; MIT/WHOI-97-18; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Ocean Acoustic Tomography inverts for the two- or three-dimensional sound speed structure in a volume of water by measuring acoustic travel times along ray paths traversing the volume. The sensitivity of the acoustic travel times to particular modes of sound speed variation is highly dependent on the source and receiver positions. Autonomous underwater vehicles provide mobile instrument platforms at relatively low cost. Tomography sources mounted on AUVs can be adaptively repositioned to better image emerging sound speed features. The goal of optimal moving source tomography is to make optimal use of mobile controllable tomography sources in gaining information about the environment. The component technologies for optimal moving source tomography are position estimation, sound speed parameterization and estimation, ray path identification, and vehicle path optimization. This thesis makes contributions in each of these areas.

DTIC

Acoustic Velocity; Tomography; Navigation

Includes atomic structure, electron properties, and molecular spectra.

19980009094 Washington Univ., Dept. of Physics, Saint Louis, MO USA

Nuclear Physics at 1,700,000,000,000 K

Bernard, Claude, Washington Univ., USA; Ogilvie, Michael C., Washington Univ., USA; DeGrand, Thomas A., Colorado Univ., USA; DeTar, Carlton, Utah Univ., USA; Gottlieb, Steven, Indiana Univ., USA; Krasnitz, A., Indiana Univ., USA; Sugar, R. L., Indiana Univ., USA; Toussaint, D., California Univ., USA; Proceedings of the 1991 Annual Users' Conference; Nov. 1991, pp. 219-230; In English; Also announced as 19980009083

Contract(s)/Grant(s): DE-FG02-85ER-40213; DE-AC02-86ER-40253; DE-AC02-84ER-40125; DE-AC02-78ER-04915; NSF PHY-90-08482; NSF PHY-86-14185; No Copyright; Avail: Issuing Activity (Supercomputer Systems Div., Intel Corp., Beaverton, OR 97006), Hardcopy, Microfiche

At high enough temperatures the thermal energies of protons, neutrons and other 'elementary' particles are comparable to their rest masses. When this happens, theorists predict that these particles may dissolve into a phase called the 'quark-gluon plasma'. The physics of this phase is described by approximately free quarks and gluons, instead of the familiar protons, neutrons and pions. In the big bang picture of the origin of the universe, the early universe spent time at these temperatures. Thus the physics of this regime could be important for understanding the evolution of the present universe. Also, temperatures of this magnitude are reached in the collisions of energetic heavy ions at large accelerators. Our group and many other groups have been using large scale computer simulations to study strong interactions at these temperatures. We are currently using the iPSC/860's at the San Diego Supercomputer Center, at the SSC laboratory, and at NASA/AMES. In addition to briefly discussing the physics, we discuss the characteristics of the problem that make it amenable to parallel processing and the performance that we achieve.

Author

Collisions; Computerized Simulation; Dissolving; Elementary Particles; High Temperature; Nuclear Physics; Parallel Processing (Computers); Plasmas (Physics); Protons; Quarks

19980009142 Argonne National Lab., IL USA

Particle-beam profiling techniques on the APS storage ring

Yang, B. X., Argonne National Lab., USA; Lumpkin, A. H., Argonne National Lab., USA; [1996]; 9p; In English; 7th; Workshop on Beam Instrumentation, 6-9 May 1996, Argonne, IL, USA

Contract(s)/Grant(s): W-31-109-eng-38

Report No.(s): ANL/ASD/CP-89602; CONF-9605173-17; DE97-000986; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

Characterization of the Advanced Photon Source storage ring particle beams includes transverse and longitudinal profile measurements using synchrotron radiation-based techniques. Both optical (OSR) and x-ray synchrotron radiation stations are now installed. Spatial resolution of about $\sigma = 55$ micro-m was obtained at low current in the visible field initially. This is expected to improve during commissioning. UV/visible light from the storage ring bending magnet was used to measure the particle beam with a resolution of σ approximately 80 micro-m and allow operation at 100 mA with the initial x-ray pinhole setup. Early OSR measurements of beam size are consistent with 8.2 nm-rad emittance and 2-3% vertical coupling. Early results with the x-ray pinhole camera are also presented.

DOE

Storage Rings (Particle Accelerators); Synchrotron Radiation; Particle Beams; Photons; Emittance

19980009742 National Inst. of Standards and Technology, Gaithersburg, MD USA

Prospects for an Evaporatively Cooled Cesium Atomic Frequency Standard

Klipstein, William M., Naval Observatory, USA; Ekstrom, Christopher R., National Inst. of Standards and Technology, USA; Rolston, Steven L., National Inst. of Standards and Technology, USA; Phillips, William D., National Inst. of Standards and Technology, USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 171-178; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

Work leading to the recent achievement of Bose condensation in alkali gases has resulted in the development of a powerful set of tools for cooling atoms. A sample prepared with these techniques and ballistically expanding in a microgravity environment

would remain localized for times of order 1000 seconds. Such long interrogation times would allow the construction of clocks with extremely narrow line widths. This paper addresses parameters relevant to such a standard.

Author

Evaporative Cooling; Cesium; Atomic Clocks; Frequency Standards; Product Development

19980009801 International Centre for Theoretical Physics, Trieste, Italy

On the bound states of p- and (p+2)-branes

Gava, E., Istituto Nazionale di Fisica Nucleare, Italy; Narain, K. S., International Centre for Theoretical Physics, Italy; Mar. 1997; 33p; In English

Report No.(s): IC-97/24; DE97-629099; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)); US Sales Only, Microfiche

We study bound states of D-p-branes and D-(p+2)-branes. by switching on a large magnetic field F on the (p+2) brane, the problem is shown to admit a perturbative analysis in an expansion in inverse powers of F. It is found that, to the leading order in 1/F, the quartic potential of the tachyonic state from the open string stretched between the p- and (p+2)-brane gives a vacuum energy which agrees with the prediction of the BPS mass formula for the bound state. We generalize the discussion to the case of m p-branes plus 1 (p+2)-brane with magnetic field. The T dual picture of this, namely several (p+2)-branes carrying some p-brane charges through magnetic flux is also discussed, where the perturbative treatment is available in the small F limit. We show that once again, in the same approximation, the tachyon condensates give rise to the correct BPS mass formula. The role of 't Hooft's toron configurations in the extension of the above results beyond the quartic approximation as well as the issue of the unbroken gauge symmetries are discussed. We comment on the connection between the present bound state problem and Kondo-like problems in the context of relevant boundary perturbations of boundary conformal field theories.

DOE

Boundaries; Condensates; Stretching; Strings; Switching; Symmetry; Vacuum

19980010015 Georgia Inst. of Tech., School of Chemistry and Biochemistry, Atlanta, GA USA

The Reactivity and Dynamics of Gaseous Clusters. The Dynamics and Controlled Shaped Synthesis of Gaseous and Colloidal Nanoparticles

El-Sayed, M. A., Georgia Inst. of Tech., USA; Oct. 1997; 33p; In English

Contract(s)/Grant(s): N00014-95-I-0306

Report No.(s): AD-A330161; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In order to design new strategic materials with specific properties, we need to understand the binding forces that exist in mixed atoms or molecules not present in conventional material. Thus our aim is to understand the adhesive and cohesive forces holding atoms or molecules together in unconventional nanoparticles that do not usually bind together in conventional macroscopic materials. In the broad sense, we like to understand these forces by studying the structure, stability, and the dynamic process of the rapid electronic motion in nanoparticles. Due to the large surface to volume ratio, these particles tend to have different properties not present in the bulk nor of the individual atoms or molecules making these nanoparticles. Thus they offer us an opportunity to unravel new properties with new potential applications. The aim of our present research is to synthesize and study the forces between atoms or molecules within metallic and semiconductor nanoclusters. These forces determine the dynamic properties and thus the potential uses of the nanoparticles. In the past several years, we have confined our studies to gaseous clusters and studied the dynamics of their dissociation and their chemical reactivities. During the past couple of years (since we have moved to Georgia Tech), we have expanded our activity to include the synthesis and study of the dynamics of excitation relaxation in colloidal nanoparticles, both semiconductor and metallic. The forces that control the shapes of nanoclusters by capping agents are to be examined. The synthetic method we use involves a competition between nucleation of the atoms in the metallic nanoparticles or the semiconductor molecules in the semiconductor nanoparticle and the capping process of the surface with polymeric molecules. The faster the capping process, the smaller would be the average size of the clusters formed.

DTIC

Dynamic Characteristics; Excitation; Molecules; Nucleation; Reaction Kinetics; Reactivity; Semiconductors (Materials)

19980010592 Army Research Lab., Information Science and Technology Directorate, Adelphi, MD USA

Reciprocity Method for Obtaining the Far Fields Generated by a Source Inside or Near a Microparticle Progress Report, Oct. 1996 - Apr. 1997

Hill, Steven C., Army Research Lab., USA; Videen, Gordon, Army Research Lab., USA; Pendleton, J. D., Army Research Lab., USA; Sep. 1997; 32p; In English

Report No.(s): AD-A330175; ARL-TR-1398; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

We show that the far fields generated by a source inside or near a microparticle can be obtained readily by using the reciprocity theorem along with the internal or near fields generated by plane wave illumination. The method is useful for solving problems for which the scattered fields generated with plane wave illumination have already been obtained. We illustrate the method for the case of a homogeneous sphere, and then apply it to the problem of emission from a dipole inside a sphere near a plane interface.

DTIC

Far Fields; Near Fields; Reciprocity Theorem

19980010832 Maryland Univ., College Park, MD USA

Experiments and Theory in Ultracold Collision Dynamics *Final Report*

Weiner, John, Maryland Univ., USA; Oct. 1997; 4p; In English

Contract(s)/Grant(s): DAAH04-94-G-0028

Report No.(s): AD-A332151; ARO-31062.10-PH; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

This research program seeks to understand and control atomic collisions at ultracold temperatures where quantum and light-field effects lead to new interactions between atoms. We have pursued experimental and theoretical investigations of optical shielding and suppression, and the nature of ground-state collisions in and near a Bose-Einstein condensate. This research shows how inelastic collisions can be turned on and turned off by light fields, how the scattering length of ultracold ground-state collisions might be altered by light fields.

DTIC

Bose-Einstein Condensates; Atomic Collisions; Inelastic Collisions

19980010844 Colorado Univ., Boulder, CO USA

New Methods for Large Scale Local and Global Optimization *Final Report, 1 Oct. 1994 - 28 Feb. 1997*

Schnabel, Robert, Colorado Univ., USA; Byrd, Richard, Colorado Univ., USA; Sep. 15, 1997; 12p; In English

Contract(s)/Grant(s): F49620-94-I-0101

Report No.(s): AD-A332144; AFOSR-97-0654TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have pursued all the topic areas described in the grant proposal during the period of this grant. These include global optimization methods for molecular cluster problems, global optimization methods for protein folding problems, smoothing methods for global optimization, other optimization topics from molecular chemistry, and related large-scale optimization topics. The largest amount of effort has gone into the construction of new global optimization methods for protein folding problems and the development of new smoothing approaches for global optimization. We have extended our stochastic/perturbation approach to large-scale global optimization to deal with proteins, and have had very good success on initial test problems. We have also developed a new, analytic smoothing approach, investigated some fundamental properties of smoothing, and successfully incorporated our smoothing approach into our global optimization algorithm. The combination of smoothing and our stochastic/perturbation approach is so far producing excellent results. A related accomplishment under this grant has been the successful application of our stochastic/perturbation approach to distance geometry problems from molecular chemistry. Finally, we have developed unified limited memory/truncated Newton methods for large-scale unconstrained optimization that seem to combine many of the advantages of each approach.

DTIC

Proteins; Optimization; Smoothing; Mathematical Models

19980011522 Rutherford Appleton Lab., Theoretical Physics Dept., Chilton, UK

e+e- Yields 6 Jets in Parton Level QCD at LEP1, LEP2 and NLC

Moretti, S., Cambridge Univ., UK; Dec. 1997; ISSN 1358-6254; 17p; In English; Sponsored in part by Italian Inst. of Culture

Contract(s)/Grant(s): IIC-Prot. I/B1-690

Report No.(s): RAL-TR-97-065; Cavendish-HEP-97/14; LU-TP-97-24; Copyright; Avail: Issuing Activity (CLRC, Rutherford Appleton Lab., Chilton, Didcot, Oxfordshire, OX11 0QX, UK), Hardcopy, Microfiche

We study electron-positron annihilations into six jets at the parton level in perturbative Quantum Chromo-Dynamics. We use helicity amplitude methods. Results are presented for the case of the Durham and Cambridge jet clustering algorithms at three different collider energies.

Author

Electron Beams; Positrons; Annihilation Reactions; Partons; Experimentation; Hadrons

19980011640 Massachusetts Inst. of Tech., Lab. of Electronics, Cambridge, MA USA

Atom Interferometry Annual Report, 1 Dec. 1996 - 30 Nov. 1997

Pritchard, David E., Massachusetts Inst. of Tech., USA; Dec. 1997; 5p; In English

Contract(s)/Grant(s): N00014-96-I-0432

Report No.(s): AD-A332977; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Atom interferometers, in which atom or molecule de Broglie waves are coherently split and then recombined to produce interference fringes, have opened exciting new possibilities for precision and fundamental measurements with complex particles. The ability to accurately measure interactions that displace the de Broglie wave phase has led to qualitatively new measurements in atomic and molecular physics, fundamental tests of quantum mechanics, and new ways to measure acceleration and rotation.

DTIC

Atomic Physics; Interferometers; Interferometry

19980011673 Atlanta Univ., Office of Sponsored Programs, GA USA

Theoretical Studies of Electron and Photon Interactions With Atoms and Ions Final Report, 1 Jun. 1994 - 31 Aug. 1997

Msezane, Alfred Z., Atlanta Univ., USA; Aug. 31, 1997; 17p; In English

Contract(s)/Grant(s): F49620-94-I-0302; AF Proj. 2300

Report No.(s): AD-A332890; AFOSR-97-0710TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This grant has contributed to the establishment of a strong group in Theoretical Atomic and Molecular Physics at Clark Atlanta University. The general thrust of the group has been: (1) the development of novel theoretical methods for application to electron scattering at small-scattering angles, propulsion technologies and planetary atmospheres; (2) the calculation, using extensive configuration-interaction wave functions in sophisticated methodologies of energy levels, optical oscillator strengths, effective collision strengths for use in plasma modeling and photoionization cross sections; and (3) the support of minority students who are underrepresented in the physical and mathematical sciences. The acquisition through the AFOSR research grant of the powerful IBM RISC 6000/590 workstation and attendant software as well as the support of a Post-doctoral Fellow and students have improved the research environment at the Center for Theoretical Studies of Physical Systems (CTSPS) and impacted the training of students in the Atlanta University Center, the largest consortium of private HBCUs in the nation. National and international visitors and collaborators have been attracted to CTSPS, creating an excellent environment for research, thereby advancing the field of small-angle electron scattering to a level that has never been attained before. The project has been very productive. Twenty-five publications have been generated with an additional six publications submitted for publication in refereed journals. Additionally, 31 papers have been presented at national and international conferences over the past three years.

DTIC

Electron Scattering; Photons; Elementary Particle Interactions; Atoms; Ions; Computation; Conferences; Mathematical Models

73

NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory. For space radiation see 93 Space Radiation.

19980009892 Commissariat a l'Energie Atomique, Dept. de Recherche Fondamentale sur la Matiere Condensee, Grenoble, France

The Quadrumafios electron cyclotron resonance ion source: presentation and analysis of the results

Girard, A., Commissariat a l'Energie Atomique, France; Briand, P., Commissariat a l'Energie Atomique, France; Gaudart, G., Commissariat a l'Energie Atomique, France; Klein, J. P., Commissariat a l'Energie Atomique, France; Bourg, F., Commissariat a l'Energie Atomique, France; Debernardi, J., Commissariat a l'Energie Atomique, France; Mathonnet, J. M., Commissariat a l'Energie Atomique, France; Melin, G., Commissariat a l'Energie Atomique, France; Su, Y., Commissariat a l'Energie Atomique, France; 1993; 4p; In English; 5th; International Conference on Ion Sources, 31 Aug. - 4 Sep. 1993, Beijing, China

Report No.(s): CEA-CONF-12340; CONF-9308136; DE97-622860; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The Quadrumafios electron cyclotron resonance ion source (ECRIS) has been especially designed to permit physical studies of the plasma; this paper describes the source itself (which has been operated at 10 GHz in a first step), its preliminary performances, and the different diagnostics involved, which mainly concern the electron population (ECE, X rays, diamagnetism, micro-

wave interferometer, and electron analyser). The results are presented and discussed: there is of course a close relationship between the parameters of the plasma and the performances of the source; this point will be discussed in the article.

DOE

Diamagnetism; Electron Cyclotron Resonance; Ion Sources; Microwave Interferometers; Plasmas (Physics)

19980010006 Grand Accelerator National d'Ions Lourds, Caen, France

Acquisition and display of beam profilers

David, L., Grand Accelerator National d'Ions Lourds, France; Duneau, P., Grand Accelerator National d'Ions Lourds, France; Lecorche, E., Grand Accelerator National d'Ions Lourds, France; Lermine, P., Grand Accelerator National d'Ions Lourds, France; Vila, J., Grand Accelerator National d'Ions Lourds, France; Maugeais, C., Grand Accelerator National d'Ions Lourds, France; 1995; 8p; In English; International Conference on Accelerator and Large Experimental Physics Control Systems, 30 Oct. - 3 Nov. 1995, Chicago, IL, USA

Report No.(s): GANIL-A-95-04; CONF-9510435; DE97-625563; No Copyright; Avail: Issuing Activity (Natl Technical Information Service (NTIS)); US Sales Only), Microfiche

The ion beam adjustment requires the knowledge of its shape (its profile). A new electronic interface has been developed for the older multiwire profiles, while an other electronic equipment has been developed for the gas profiles and the microchannel plates. The data from these interfaces are computed to get numerical values and profile shapes, then transmitted by the network to the main control room to be displayed (shapes and data) on every workstation, by different beam tuning programs.

DOE

Ion Beams; Network Control; Interfaces

19980010587 Armed Forces Radiobiology Research Inst., Bethesda, MD USA

Arrays for Use at the Cobalt Irradiation Facility

Myska, James C., Armed Forces Radiobiology Research Inst., USA; Adams, Troy L., Armed Forces Radiobiology Research Inst., USA; Bhatt, Ramesh C., Armed Forces Radiobiology Research Inst., USA; Broom, John G., Armed Forces Radiobiology Research Inst., USA; Pitcher, Christopher D., Armed Forces Radiobiology Research Inst., USA; Sep. 1997; 26p; In English Report No.(s): AD-A330712; AFRRI-TR-97-2; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes current arrays used to hold and position objects for irradiation in the AFRRT 60Co irradiation facility. The arrays are specifically designed for use with nonhuman primates, canines, ferrets, guinea pigs, rats, mice, spores, cells, and chemicals. Dosimetry characteristics, such as dose conversion factors and field uniformity, have been determined for each array.

DTIC

Cobalt; Dosimeters; Irradiation; Radiation Dosage; Spores

74 OPTICS

Includes light phenomena; and optical devices. For lasers see 36 Lasers and Masers.

19980009225 NERAC, Inc., Tolland, CT USA

Plastic Lenses: Fabrication and Applications. (Latest Citations from the Rubber and Plastics Research Association Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-866967; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning research and development in the manufacture of plastic lenses. Eyeglass lenses, contact lenses, headlamps, photographic optics, optic lenses, and reflective automotive lenses are among the applications examined. Some of the materials used to fabricate lenses discussed in this bibliography include polycarbonates, acrylics, polymethyl methacrylate, hydroxyethyl methacrylate, and epoxies. Performance tests and evaluations are also included.

NTIS

Bibliographies; Plastics; Lenses; Fabrication; Performance Prediction

19980009242 NERAC, Inc., Tolland, CT USA

Optical Modulators (Latest Citations from the INSPEC Database)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869599; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning theory, development, and use of optical modulators. Included are materials, components, design aspects, and applications. The citations examine applications in optical sensors, information storage, holography, and switching devices. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Modulators

19980009281 National Inst. of Standards and Technology, Gaithersburg, MD USA

Optical Metrology for Industrialization of Optical Information Processing

Casasent, D., Carnegie-Mellon Univ., USA; Wilson, C. L., National Inst. of Standards and Technology, USA; Sep. 1997; 15p; In English

Report No.(s): PB97-210801; NISTIR-6060; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

One of the major barriers to commercial application of optical technology to information processing is the high cost of system development and manufacture. This problem has been solved in other industries through the use of CAD and integration of system design with manufacturing. The development of better system metrology is needed to allow more computer based methods to be used in this process. As a test case, we are designing an optical pattern recognition system to be performed on an input image (at video rates) versus a large reference set, for example 1000 faces, with images of at least 640 by 480 pixels size. This report documents some of the technical issues involved.

NTIS

Optical Data Processing; Pattern Recognition; Systems Engineering; Computer Aided Design; Industries

19980009343 NERAC, Inc., Tolland, CT USA

Integrated Optics (Latest Citations from the US Patent Bibliographic File with Exemplary Claims)

May 1996; In English; Page count unavailable

Report No.(s): PB96-869664; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design, fabrication methods, and applications of integrated optical devices, including waveguide circuits, transducers, couplers, detectors, and analyzers. Integrated optical techniques used in waveguide couplings and optical communications are discussed. Selected patents are also included for polymer materials used in the manufacture of integrated optical devices. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Integrated Optics; Bibliographies; Optical Equipment

19980009540 NERAC, Inc., Tolland, CT USA

Optical Coatings. (Latest citations from the Energy Science and Technology Database)

Apr. 1996; In English; Page count unavailable.

Report No.(s): PB96-867692; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning research and development of optical coating technology. Application methods, properties, and evaluation of reflective and antireflection optical coatings are included. Applications in high power lasers, solar engineering ground equipment, and solar cells are discussed. Processes and the technology of coating plastics and metals with optical coatings are also considered. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Research and Development; Coating; Coatings

19980009631 Virginia Polytechnic Inst. and State Univ., Center for Intelligent Material Systems and Structures, Blacksburg, VA USA

Third ARO Workshop on Smart Structures Final Report

Sep. 1997; 546p; In English; 3rd, 27-29 Aug. 1997, Blacksburg, VA, USA

Contract(s)/Grant(s): DAAG55-97-I-0335

Report No.(s): AD-A332080; ARO-37335.1-EG-CF; No Copyright; Avail: CASI; A23, Hardcopy; A04, Microfiche

The report documents the information presented at the third ARO Workshop on Smart Structures. The workshop was held 27-29 August 1997 in Virginia Polytechnic Institute and State University, Blacksburg, VA. The report contains the extended abstracts of the oral workshop and poster presentations given by the Army Research Office funded contractors.

DTIC

Smart Structures; Abstracts; Conferences

19980009773 Texas A&M Univ., Dept. of Mathematics, College Station, TX USA

Optimal Design of Diffractive Optical Structures *Final Report, 15 Aug. 1995 - 14 Aug. 1997*

Dobson, David C., Texas A&M Univ., USA; Sep. 01, 1997; 4p; In English

Contract(s)/Grant(s): F49620-95-I-0497

Report No.(s): AD-A332330; AFOSR-TR-97-0679; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

An optimal design method for low-order periodic dielectric diffractive structures in E-parallel polarization has been developed. A key property of the method is that nonsmooth design profiles present no theoretical or practical difficulties so that manufacturable designs can be achieved. The method is based on an accurate partial differential equation diffraction model. It has been theoretically justified, implemented, and applied to reveal some unexpected high-efficiency diffractive structures for potential use in photonic and micro-optical devices. Research associated with the development of the method has led to efficient numerical methods for calculating diffraction through grating structures and improved understanding of total variation methods for image processing and inverse problems, and has established the groundwork for three-dimensional design methods.

DTIC

Partial Differential Equations; Design Analysis; Optical Equipment; Mathematical Models; Dielectrics

19980009936 NERAC, Inc., Tolland, CT USA

Fresnel Lenses: Latest Citations from the US Patent Bibliographic File with Exemplary Claims

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-863519; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning the design and implementation of Fresnel lenses. Citations focus on manufacturing methods and designs for specific applications. Fresnel lenses used in overhead projectors, solar concentrators, and infrared motion detectors are also described.

NTIS

Bibliographies; Fresnel Lenses; Design Analysis; Technology Utilization; Manufacturing

19980010025 Arizona Univ., Optical Sciences Center, Tucson, AZ USA

Developing Rare-Earth Doped Semiconductor Light Sources *Final Report, 1 Aug. 1994 - 31 Mar. 1997*

Khitrova, Galina, Arizona Univ., USA; Gibbs, Hyatt M., Arizona Univ., USA; Jun. 02, 1997; 37p; In English

Contract(s)/Grant(s): F49620-94-I-0390; AF Proj. 2305

Report No.(s): AD-A329764; AFOSR-97-0411TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The possibility of enhancing the luminescence efficiency of Er ions embedded in a semiconductor was investigated by growing about forty erbium-doped InGaAs/GaAs and GaAs/AlGaAs multiple quantum well samples by molecular beam epitaxy. The idea was to enhance the semiconductor-to-erbium transfer when the quantum well and erbium-ion transition energies are equal. Photoluminescence of Er ions and Er induced defects was studied at liquid helium and higher temperatures. A strong diffusion of erbium and interdiffusion of Ga and Al ions was observed, leading at high erbium concentrations to the degradation of the QW's and macroscopic average leveling of Er and Al concentrations over the whole grown structure. From high-resolution photoluminescence spectra the existence of three types of Er centers was deduced which differ by positions of fine structure lines, photo luminescence lifetimes, and temperature dependence. These centers cause three types of carrier traps with binding energies of 20, 50, and 400 meV. Evidence is given that carriers captured into these traps control the Auger excitation of Er ions assisted by multiphonon emission. Er luminescence associated with the 400 meV trap is still detectable at room temperature. This grant was terminated abruptly after 71% of the funding was received, purportedly for financial rather than scientific reason.

DTIC

Erbium; Metal Ions; Indium Gallium Arsenides; Aluminum Gallium Arsenides; Doped Crystals; Molecular Beam Epitaxy; Quantum Wells; Light Sources

19980010038 Army Research Lab., Adelphi, MD USA

Qualitative Light-Scattering Angular Correlations of Conglomerate Particles *Progress Report, Oct. 1996 - May 1997*

Videen, Gordon, Army Research Lab., USA; Pellegrino, Paul, Army Research Lab., USA; Ngo, Dat, NgoCo, USA; Nachman, Paul, Army Research Lab., USA; Nov. 1997; 27p; In English

Report No.(s): AD-A332013; ARL-TR-1396; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The scattering phase functions of micrometer-size glycerol droplets containing spherical latex inclusions undergo random fluctuations with time. We measure scattering intensities in the near-forward and near-backward scattering directions and find them to have strong positive correlations during some time periods and strong negative correlations during other time periods. The characteristic time constants of these correlations are on the order of seconds. We calculate scattering correlations from two types of scattering systems. Correlations from an aggregate of two isolated spheres are generally positive, whereas correlations from a sphere containing a single spherical inclusion may be both positive and negative. Calculations of correlations from our experimental data are consistent with diffusion of inclusions within the host droplet, rather than interference effects between the inclusions.

DTIC

Light Scattering; Angular Correlation; Backscattering; Scattering Functions

19980010050 Connecticut Univ., Storrs, CT USA

All Fiber-Based Optical Transmitters and Switching Technologies *Final Report, 1 Jul. 1995 - 30 Sep. 1997*

Cheo, Peter K., Connecticut Univ., USA; Sep. 30, 1997; 11p; In English

Contract(s)/Grant(s): F49620-95-I-0463; AF Proj. C486

Report No.(s): AD-A330759; AFOSR-TR-97-0518; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report describes a two-year research effort directed toward the understanding of very robust fiber lasers utilizing Yb:Er co-doped fiber for the gain medium. We have achieved stable CW output utilizing in-fiber Bragg grating technology. of the greatest importance is the effectiveness of Yb:Er co-doped fibers for the purpose of suppressing ion-pair induced Q-switching and for the enhancement of pumping in high gain fibers.

DTIC

Bragg Gratings; Continuous Radiation; High Gain; Optical Switching; Stability; Transmitters

19980010051 Technische Univ., Delft, Netherlands

Mo/Si Multilayer Optics for Micro-Lithography *Mo/Si Multilaags-Spiegels voor Microlithografie*

Voorma, H. J., Technische Univ., Netherlands; Jan. 20, 1997; 115p; In English

Report No.(s): PB97-156947; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis describes the development of x-ray optical elements for micro-lithography, such as mirrors, and the design of an imaging system. The entire system consists of a two-mirror imaging system, a reflection mask and an illuminator and is described in Chapter 2. In Chapter 3, a newly developed method is discussed that allows determination of the multilayer parameters directly from the data of the small-angle-reflectivity measurement. The first technique (Chapter 4) concerns the use of an increased substrate temperature, and has been investigated in a wide temperature range (300-550 K). In Chapter 5, a second additional technique, ion bombardment, is investigated to improve the multilayer quality, i.e. reduce the interface roughness. In Chapter 6, EXAFS measurements are performed to investigate the structure and chemical composition of the layers. In Chapter 7, a newly developed fabrication procedure for EUVL reflection masks is described.

NTIS

Imaging Techniques; X Rays; X Ray Absorption; Optics

19980010115 University of Southern California, Dept. of Chemistry, Los Angeles, CA USA

Development and Utilization of Device Quality Nonlinear Optical Materials *Final Report, 1994-1997*

Dalton, Larry R., University of Southern California, USA; Aug. 05, 1997; 16p; In English

Contract(s)/Grant(s): F49620-94-I-0312; AF Proj. 1651

Report No.(s): AD-A329678; AFOSR-97-0375TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The primary objective of this contract is to develop processible nonlinear optical materials and processing protocols which permit fabrication of prototype electro-optic modulator devices and integrated opto-electronic circuits. This effort provides the primary materials support for device development efforts carried out by W. H. Steier at USC, H. Feflerman at UCLA, Y. Shi at TACAN, W. Bischel at Deacon Research, and R. Mustacich at RVM Scientific.

DTIC

Optical Materials; Optoelectronic Devices; Protocol (Computers); Integrated Circuits

19980010332 Defence Science and Technology Organisation, Canberra, Australia

Asynchronous Single Platform Sensor Fusion

Krieg, Mark L., Defence Science and Technology Organisation, Australia; Jun. 1997; 43p; In English

Report No.(s): AD-A329956; DSTO-TN-0084; DODA-AR-010-219; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Multi-sensor tracking potentially has many advantages over single sensor tracking. This report evaluates the performance of a multi-sensor tracking algorithm, the asynchronous fused Kalman filter, using both simulated and real data from two dissimilar sensors. The real data was collected using a sensor fusion test-bed consisting of two sensors, a pulse Doppler radar and an optical video tracker. The performance of the algorithm has been evaluated under various conditions including clear sky, clutter, multiple targets and intermittent sensor operation. The effect of sensor fusion on the system's robustness to model mismatch has also been investigated.

DTIC

Doppler Radar; Optical Tracking; Tracking Radar; Multisensor Fusion; Multiple Target Tracking; Synchronism; Multisensor Applications

19980010336 NERAC, Inc., Tolland, CT USA

Flat Panel Displays. (Latest Citations from the INSPEC Database)

Feb. 1996; In English

Report No.(s): PB96-863410; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design and use of flat panel display systems. Topics include display characteristics, the use of thin film transistors in specific devices, and fabrication and materials aspects. Applications in television, computers, video monitors, and instrumentation displays are considered. Market trends of flat panel displays are also examined.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Flat Panel Displays

19980010337 NERAC, Inc., Tolland, CT USA

Optical Signal Processing: Latest Citations from the INSPEC Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862610; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning optical signal processing applications. Topics include use in silica-on-silicon, light modulators, pulse demultiplexing, electron trapping materials, photonic switching technology, and laser diodes. Uses in fingerprint identification and local-access networks are also examined.(Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Optical Data Processing

19980010446 Centro Siciliano per le Ricerche Atmosferiche e di Fisica dell'Ambiente, Messina, Italy

The Optical Properties of Aerosols Final Report

Borghese, F., Centro Siciliano per le Ricerche Atmosferiche e di Fisica dell'Ambiente, Italy; Sep. 1997; 22p; In English

Contract(s)/Grant(s): N68171-96-C-9056

Report No.(s): AD-A331428; R/D-7901-EN-01; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The research performed under the present contract has dealt with the following items: 1) Optical properties of inclusion-containing hemispheres deposited on a perfectly reflecting surface. 2) Optical resonances of homogeneous spheres containing an eccentric spherical inclusion. 3) Optical properties of aggregated spheres deposited on a dielectric surface. These researches are fully expounded in papers that have already been submitted for publication or are in an advanced stage of completion. Therefore, in the present report, we outline the motivations behind each work and summarize the main results.

DTIC

Aerosols; Dielectrics; Optical Properties; Optical Resonance

19980010547 Vavilov State Optical Inst., Saint Petersburg, USSR

The Study of Possibility to Implement the Dynamic Nonlinear-Optical Corrector Based on the Use of the Optical Negative-Feedback Loop for Correction for Distortions of Large Scale Optics Final Report

Venediktov, Vladimir Y., Vavilov State Optical Inst., USSR; Jan. 1997; 68p; In English

Contract(s)/Grant(s): F61708-96-W-0309

Report No.(s): AD-A332625; EOARD-SPC-96-4094; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Research institute for Laser Physics as follows: The contractor will perform a comparative analysis of approaches to overcoming the 2 pi problem in nonlinear optical feedback correction schemes and determine an optimal solution.

DTIC

Nonlinear Optics; Research; Optical Correlators; Dynamical Systems; Nonlinearity

19980010549 NERAC, Inc., Tolland, CT USA

Optical Filters (Latest Citations from the US Patent Bibliographic File with Exemplary Claims)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863634; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning optical filter materials and devices. The design and fabrication of low pass, high pass, multipass, bandpass, impurity-band, tunable, and interference filters are presented. Applications cover optical communication systems, optical information systems, image sensors and imaging devices, wavelength division multiplexing systems, and infrared detectors. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Optical Filters; Tunable Filters

19980010602 Kent Univ., Dept. of Physics, Canterbury, UK

Optimal Shack-Hartmann Wavefront Sensing For Low-Light-Levels Final Report

Solomon, Christopher J., Kent Univ., UK; Oct. 1997; 51p; In English

Contract(s)/Grant(s): F61708-96-W-0206

Report No.(s): AD-A332416; EOARD-96-4054; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This report results from a contract tasking Physics Laboratory, University of Kent at Canterbury as follows: The contractor will investigate optimal estimation techniques for low light level wavefront sensing. He will analyze the sensitivity gains achievable in shack-hartmann wavefront sensors using bayesian estimators and compare the results with those achieved using a standard least squares approach. Investigate optimal wavefront sensor sub-aperture geometries.

DTIC

Detection; Estimating; Sensitivity; Statistical Analysis; Wave Fronts

19980010611 NERAC, Inc., Tolland, CT USA

Optical Transmission (Latest Citations from the US Patent Bibliographic File with Exemplary Claims)

Feb. 1996; In English; Page count unavailable

Report No.(s): PB96-863642; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations of selected patents concerning optical transmission materials, devices, and systems. The design and fabrication of optical transmitters, amplifiers, transmitting and receiving circuits, and control devices are presented. References cover laser driving circuits, optical transmission fibers, optical beam splitters, underground transmission lines, path switches, fault detection, circuit protection, signal-to-noise ratio reduction, and space charge buildup. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Optical Communication; Light Transmission

19980010968 Department of the Navy, Washington, DC USA

Method and Apparatus for Infrared Detection of a Moving Target in the Presence of Solar Clutter

Crosby, Holmes, Department of the Navy, USA; Wardlow, Michael J., Department of the Navy, USA; Jul. 31, 1997; 28p; In English

Patent Info.: US-Patent-Appl-SN-903-250

Report No.(s): AD-D018603; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

A detection system for detecting a target flying over water, which includes a detector positioned to receive radiation reflected by the target off the water, and producing a detector output signal having an amplitude proportional to the amount of received radiation, a high-pass filter for passing portions of the detector output signal having a frequency greater than a prescribed threshold frequency, and for blocking portions of the detector output signal having a frequency lower than the prescribed threshold frequency. The prescribed threshold frequency is sufficiently high to ensure that only the portions of the detector output signal output signal produced by the radiation reflected by the target off the water are passed by the high-pass filter, and that portions of the detector output signal produced by solar glitter are not passed. In a specific embodiment, the system is designed to be installed on a ship for the purpose of detecting low-flying, fast-moving targets, such as cruise missiles.

DTIC

Infrared Detectors; Signal Transmission

19980011512 Massachusetts Univ., Dept. of Chemistry, Lowell, MA USA

Generalized Expressions of Effective Nonlinear Optical Coefficient for Non-collinear Phase Matching in Uniaxial and Cubic Media, 1 Jun. 1997 - 30 Sep. 1998

Yang, Ke, Massachusetts Univ., USA; Tripathy, S., Massachusetts Univ., USA; Kumar, J., Massachusetts Univ., USA; Dec. 08, 1997; 30p; In English

Contract(s)/Grant(s): N00014-90-J-1148

Report No.(s): AD-A332764; TR-96-06; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The conditions of non-collinear phase matched frequency conversion are analyzed and the corresponding expressions of the effective nonlinear optical coefficient (d_{eff}) for 13 classes of uniaxial crystals and 3 classes of cubic crystals are derived. The discussed cases correspond to the situation when d_{ijk} not equal d_{ikj} , when $d_{ijk} = d_{ikj}$, and when Kleinman symmetry condition holds, with the general consideration that the extraordinary ray (e-ray) is not perpendicular to the phase propagation vector k in the uniaxial medium.

DTIC

Crystals; Nonlinearity; Phase Matching; Frequency Converters; Collinearity

19980011535 NERAC, Inc., Tolland, CT USA

Optical Filters. (Latest citations from the Ei Compendex*Plus database)

Nov. 1997; In English; Page count unavailable.

Report No.(s): PB98-851066; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and implementation of optical filters used in optical communication. References review tunable, ultrafast, narrowband, thin film, programmable, atomic resonance, and bandpass filters. Topics include wavelength and frequency division multiplexing systems, integrated optoelectronics, acoustooptical devices, electrooptical devices, optical radar, optical communication security, and interference immunity.

NTIS

Bibliographies; Optical Filters; Electro-Optics; Design Analysis; Fabrication

19980011536 NERAC, Inc., Tolland, CT USA

Optical Directional Couplers. (Latest citations from the INSPEC Database)

Nov. 1997; In English; Page count unavailable.

Report No.(s): PB98-851058; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the design, fabrication, and performance of optical directional couplers used in optical communication. References review nonlinear, optical fiber, planar, parallel, symmetric, and intracavity couplers. Topics include waveguides, optical modulators and switches, bistability and chaos, high-speed computing, ultrafast signal processing, and remote coupling.

NTIS

Bibliographies; Directional Couplers; Design Analysis; Fabrication; Performance Prediction

19980011676 Washington State Univ., Dept. of Physics, Pullman, WA USA

International Conference on Organic Nonlinear Optics 3 (ICONO'3) Final Report, 2 Feb. 1996 - 30 Jun. 1997

Kuzyk, Mark G., Washington State Univ., USA; Dec. 1997; 219p; In English

Contract(s)/Grant(s): N00014-96-I-0496

Report No.(s): AD-A332901; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The objective of ICONO'3 was to bring together top researchers - whose expertise spans material design, material characterization, device fabrication, and integrated device architectures - to the captive setting of a small island to discuss and assess progress in the field of organic nonlinear optics (meeting headquarters on Marco Island, Florida). ONR funds were used to partially offset the travel expenses of U.S. invited speakers and students. This conference was motivated by 2 previous conference sessions that were held in Val Thorens, France in the Winter of 1994 (ICONO'1); and in Kusatsu, Japan in the Summer of 1995 (ICONO'2). The demand for such a meeting was evidenced by full-capacity attendance at the last three meetings (ICONO'1, ICONO'2 and ICONO'3). The meeting has succeeded in bringing together a group of internationally distinguished researchers to the USA to rigorously discuss and assess the field. (A majority of attendees were from abroad.)

DTIC

Fiber Optics; Nonlinear Optics; Conferences; Organic Materials

75

PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion. For ionospheric plasmas see 46 Geophysics. For space plasmas see 90 Astrophysics.

19980009461 National Inst. for Fusion Science, Theory and Computer Simulation Center, Toki, Japan

Magnetohydrodynamic Approach to the Feedback Instability

Watanabe, T.-H., National Inst. for Fusion Science, Japan; Sato, T., National Inst. for Fusion Science, Japan; Jul. 1997; ISSN 0915-633X; 16p; In English

Report No.(s): NIFS-495; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Starting from the ideal magnetohydrodynamic and two-fluid equations, the linear analysis of the feedback instability has been made in a coupled system of perfectly and partially ionized plasmas. The obtained eigenfunction and frequency of the unstable mode are qualitatively consistent with observations of auroral arcs.

Author

Auroral Arcs; Magnetohydrodynamic Waves; Numerical Analysis; Plasmas (Physics)

19980009511 Association Euratom-CEA, Dept. de Recherches sur la Fusion Contrôlée, Saint Paul-les-Durance, France

Recent results on current profile shaping on torus

Becoulet, A., Association Euratom-CEA, France; 1994; 9p; In English; ICPP 1994: International Conference on Plasma Physics, 31 Oct. - 4 Nov. 1994, Foz do Igacu, Brazil

Report No.(s): CEA-CONF-12123; CONF-9410249; DE97-622956; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The link between the current profile and the confinement is studied, involving various regimes: high power minority ion cyclotron resonant heating, high power lower hybrid current drive, fast wave direct electron heating and current drive and pellet enhanced performance. It is shown that the electron heat diffusivity decreases when the magnetic shear increases in the confinement zone and/or when it decreases in the plasma centre.

DOE

Tokamak Devices; Confinement; Plasma Currents

19980009767 General Atomics Co., San Diego, CA USA

Impact of edge current density and pressure gradient on the stability of D3-D high performance discharges

Lao, L. L., General Atomics Co., USA; Ferron, J. R., General Atomics Co., USA; Strait, E. J., General Atomics Co., USA; Jun. 1997; 7p; In English; 24th; EPS Conference on Controlled Fusion and Plasma Physics, 9-13 Jun. 1997, Berchtesgaden, Germany
Contract(s)/Grant(s): DE-AC03-89ER-51114; DE-AC05-96OR-22464; DE-FG02-89ER-53297; W-7405-eng-48

Report No.(s): GA-A22640; CONF-9706131-11; DE97-007895; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

One of the major goals of advanced tokamak research is to develop plasma configurations with good confinement and improved stability at high (beta). In D3-D, various high performance configurations with H- and VH-mode edges have been produced. These include discharges with poloidal cross sections in the forms of dee and crescent shapes, single- and double-null divertors, and with various central magnetic shear profiles and current profile peakedness. All these discharges exhibit confinement

in the outer plasma region which leads to a large edge pressure gradient and a large edge bootstrap current driven by this steep pressure gradient. These edge conditions often drive an instability near the edge region which can severely degrade the discharge performance. An understanding of this edge instability is essential to sustain an enhance discharge performance.

DOE

Tokamak Devices; Current Density; Pressure Gradients

19980009915 China Nuclear Information Centre, Beijing, China

Plasma toroidal voltage and current measurements on SWIP-RFP device

Li, Qiang, Southwest Inst. of Physics, China; Zhang, Peng, Southwest Inst. of Physics, China; Luo, Cuiwen, Southwest Inst. of Physics, China; Aug. 1996; 16p; In English

Report No.(s): CNIC-01090; SIP-0093; DE97-619880; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The plasma toroidal voltage and toroidal current measurement methods and some results on SWIP-RFP device are presented. The preliminary model for the toroidal voltage of an RFP plasma is analyzed. The toroidal voltage measured with an one turn coil depends largely on the external current, i.e. there is an inducted component in the one turn coil voltage. Even though the inducted component is taken into account, the plasma toroidal voltage for an RFP plasma exceeds the classical resistive toroidal voltage for a toroidally driven system, this is an interesting subject related to the plasma helicity balance for an RFP plasma. The electromagnetic features related to the toroidal voltage measurement are studied. The experiments show that the plasma current is above 60 kA normally, with better discharge conditions, the plasma current can be driven to 100 kA. The one turn coil voltage is about 250 V with maximum plasma current during a discharge. These results are consistent with the estimated results via other signals, furthermore, high plasma current density and the existence of anomalous toroidal voltage for the RFP plasma are revealed.

DOE

Current Density; Electric Potential; High Current; Plasma Currents; Static Electricity

19980010003 Los Alamos National Lab., NM USA

Preliminary experimental results on studying possibility of variable mass liner (VML) formation

1995; 199p; In English

Contract(s)/Grant(s): W-7405-eng-36

Report No.(s): LA-SUB-95-205; DE97-002941; No Copyright; Avail: Issuing Activity (Nat'l Technical Information Service (NTIS)), Microfiche

The main objective of the present experiment was to study the formation process and initial stage of acceleration of a variable-mass plasma liner (VML). The method is based on magnetic acceleration of a liner with the mass reduced during such acceleration. The experiment was carried out on February 16 at VNIIEF. This report describes the results of measurements obtained in the experiment and preliminary analysis of the results characterizing operation of the test facility main units: helical EMG; 5-module disk EMG 400 mm in diameter (DEMG); ponderomotive unit (PU) with a cylindrical condensed liner and a special tooth-cutoff. The first part of the report presents measurement results obtained on the VNIIEF's diagnostic equipment that are compared with those obtained by American specialists on their diagnostic equipment. Information submitted by American specialists is included in part 2 of this report. The second part of the report presents preliminary computational-theoretic analysis of the main measured results describing operation of DEMG TL system in the experiment; experimental data are compared with theoretical ones obtained before and after the experiment. But more emphasis is placed on the data preliminary analysis indicating that in the experiment a variable mass liner is formed (VML or plasma bubble).

DOE

Plasma Bubbles; Plasma Acceleration; Plasma Generators

19980010004 China Nuclear Information Centre, Beijing, China

Effects of radial electrical field on neoclassical transport in tokamaks

Wang Zhongtian, Southwest Inst. of Physics, China; Le Clair, G., Centre Canadian de Fusion Magnetique, Canada; Jul. 1996; 16p; In English

Report No.(s): CNIC-01082; SIP-0092; DE97-619879; ISBN 7-5022-1529-8; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Neoclassical transport theory for tokamaks in presence of a radial electrical field with shear is developed using Hamiltonian formalism. Diffusion coefficients are derived in both plateau regime including a large electric field and banana regime including the squeezing factor which can greatly affect diffusion at the plasma edge. The scaling on squeezing factor is different from the

one given by Shaing and Hazeltine. Rotation speeds are calculated in the scrape-off region. They are in good agreement with measurements on TdeV Tokamak.

DOE

Electric Fields; Tokamak Devices; Transport Theory

19980010005 Netherlands Energy Research Foundation, Petten, Netherlands

Neutronic calculations for JET Final Report

Verschuur, K.A., Netherlands Energy Research Foundation, Netherlands; Oct. 1996; 30p; In English

Contract(s)/Grant(s): CEC-JE0/9004

Report No.(s): ECN-C-96-053; DE97-621431; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Neutron-transport calculations with the FURNACE(2) program system, in support of the Neutron Diagnostic Group at JET, have been performed since 1980, i.e. since the construction phase of JET. FURNACE(2) is a ray-tracing/multiple-reflection transport program system for toroidal geometries, that originally was developed for blanket neutronics studies and which then was improved and extended for application to the neutron-diagnostics at JET.

DOE

Tokamak Devices; Reactor Materials

19980010610 Japan Atomic Energy Research Inst., Dept. of Fusion Plasma Research, Tokyo, Japan

The design study of the JT-60SU device, No. 5, The Power Supply for Coils of JT-60SU

Aoyagi, Tetsuo, Japan Atomic Energy Research Inst., Japan; Nagashima, Keisuke, Japan Atomic Energy Research Inst., Japan; Kitai, Tatsuya, Japan Atomic Energy Research Inst., Japan; Mori, Katsuharu, Japan Atomic Energy Research Inst., Japan; Nakagawa, Syouji, Japan Atomic Energy Research Inst., Japan; Kurita, Gen-ichi, Japan Atomic Energy Research Inst., Japan; Kikuchi, Mitsuru, Japan Atomic Energy Research Inst., Japan; Nagami, Masayuki, Japan Atomic Energy Research Inst., Japan; Feb. 1997; 64p; In Japanese

Report No.(s): JAERI-Research-97-010; DE97-745375; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The power supply system for coils of JT-60SU consists of five sub-systems, which are the toroidal field coil sub-system feeding continuously to the 18-toroidal field coils (super conducting coils), the poloidal field coil sub-system feeding to the 10-poloidal field coils (super conducting coils) in pulsed operation, the fast position control sub-system feeding to the vertical plasma position control coils (ordinary conducting coils), the correction field sub-system feeding to the error field correction coils (super conducting coils) for compensation of asymmetric error fields causing the locked-mode, and the electric generator sub-system for these sub-systems. This report describes the conceptual design results of the power supply system. (author)

DOE

Electric Power Supplies; Tokamak Devices; Design Analysis; Magnetic Coils

19980010935 Stanford Univ., High Temperature Gasdynamics Lab., Stanford, CA USA

Transport of Air Plasma Final Report, 15 Aug. 1993 - 31 Aug. 1997

Kruger, Charles H., Stanford Univ., USA; Sep. 1997; 27p; In English

Contract(s)/Grant(s): F49620-94-I-0052; AF Proj. 2301

Report No.(s): AD-A330595; AFOSR-TR-97-0524; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Several optical diagnostic techniques were developed to interrogate important plasma parameters including temperatures and species concentrations. In particular, a new technique of electron number density measurements based on measurements of the nonequilibrium population of the predissociative C state of NO was devised. It was found that the three-body NO recombination rate proposed by Dunn and Kang appears to be too slow by a factor 100, and that the rate proposed by Gupta et al. or Park is also too slow, by about a factor 10. This result has significant implications for the development of techniques to create and maintain elevated electron number densities in air plasmas.

DTIC

Recombination Reactions; Electron Density (Concentration); Nitrogen Oxides

19980010979 Phillips Lab., Kirtland AFB, NM USA

Joint DoD/DOE PRS Simulator Upgrade: Load Physics Stability Risk Mitigation Management Final Report, 20 Jun. 1994 - 31 Dec. 1994

Roderick, Norman F., Phillips Lab., USA; Peterkin, Robert E., Jr., Phillips Lab., USA; Hussey, Thomas W., Phillips Lab., USA; Jul. 1997; 52p; In English

Contract(s)/Grant(s): AF Proj. DNA0

Report No.(s): AD-A331967; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Plasmas are subject to many instabilities that make control of their components particularly difficult. It is well known that z-pinchs are subject to Rayleigh-Taylor-like instabilities. This report analyzes MJ-level, 50 ns gas-puff z-pinchs performed on the Saturn accelerator at Sandia National Laboratory with the magnetohydrodynamic codes Mach2 and Mach3. This analysis indicates that the uniformity of the pinch depends on the thickness of the initial gas-puff. Three-dimensional calculations suggest that modes with azimuthal asymmetry cause only modest changes to the radiative yield of fast z-pinchs.

DTIC

Plasma Control; Magnetohydrodynamic Stability; Zeta Pinch

19980010986 China Nuclear Information Centre, Beijing, China

The anomalous Doppler instabilities during OH discharges and LHCD on HL-1

Cao, Jianyong, Southwest Inst. of Physics, China; Xu, Deming, Southwest Inst. of Physics, China; Ding, Xuanton, Southwest Inst. of Physics, China; Wang, Enyao, Southwest Inst. of Physics, China; Dec. 1996; 10p; In English; In Chinese

Report No.(s): CNIC-01131; SIP-0096; DE97-633198; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

Microwave heterodyne receivers were used to measure the nonthermal emission during ohmic (OH) discharges and lower hybrid current driven (LHCD) on the HL-1 tokamak. The nonthermal emission caused by magnetic plasma wave, electron cyclotron emission (ECE) and Cherenkov emission of the relativistic electrons has been described in detail. The fluctuation of the magnetic plasma wave emission and the abrupt increasing of ECE are related to the anomalous Doppler instabilities (ADI) driven by tail anisotropy of the electron distribution function. During LHCD, ADI is suppressed obviously and the particle confinement is improved. The suppression mechanism of ADI, and the relations between the suppression of ADI and the improvement of the particle confinement are discussed.

DOE

Tokamak Devices; Electron Distribution; Stability; Doppler Effect; Current Distribution

19980011273 Japan Atomic Energy Research Inst., Dept. of Fusion Plasma Research, Tokyo, Japan

Analysis of divertor asymmetry using a simple five-point model

Hayashi, Nobuhiko, Japan Atomic Energy Research Inst., Japan; Takizuka, Tomonori, Japan Atomic Energy Research Inst., Japan; Hatayama, Akiyoshi, Japan Atomic Energy Research Inst., Japan; Ogasawara, Masatada, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 41p; In English

Report No.(s): JAERI-Research-97-018; DE97-750683; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A simple five-point model of the Scrape-Off Layer (SOL) plasma outside the separatrix of a diverted tokamak has been developed to study the inside/outside divertor asymmetry. The SOL current, gas pumping/puffing in the divertor region, and divertor plate biasing are included in this model. Gas pumping/puffing and biasing are shown to control divertor asymmetry. In addition, the SOL current is found to form asymmetric solutions without external controls of gas pumping/puffing and biasing.

DOE

Diverters; Asymmetry; Atomic Mobilities; Charge Distribution; Plasma Layers; Wall Flow

19980011543 Institute of Electrical and Electronics Engineers, Washington, DC USA

Conference Proceeding for 1997 IEEE 24th International Conference on Plasma Sciences Final Report

Hyman, Julius, Institute of Electrical and Electronics Engineers, USA; Jan. 1997; 367p; In English; 24th, 19-22 May 1997, San Diego, CA, USA; Sponsored by Institute of Electrical and Electronics Engineers, USA

Contract(s)/Grant(s): F49620-97-I-0314

Report No.(s): AD-A332886; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This 360 page softbound publication includes the following major sections, An invitation to ICOPS'97, Catamaran Resort Hotel Floor Pinas, Officers of the IEEE Nuclear and Plasma Sciences Society, Conference Information (including committees, session organizers, mini-course, hotel and travel information, future ICOPS conferences, IEEE membership information, etc.), Summary of Technical Sessions, Conference Record Abstracts, Index by author, List of Previous Conferences, 1998 Conference, and a map of San Diego. The summary of Technical Sessions shows the sessions times and locations and the titles and authors of the presentations.

DTIC

Plasmas (Physics); Collisional Plasmas; Boundary Layer Plasmas

19980011629 Japan Atomic Energy Research Inst., Dept. of Fusion Plasma Research, Tokyo, Japan

The design study of the JT-60SU device, No. 2, The Physical Design and Diagnostic System of JT-60SU

Kurita, Gen-ichi, Japan Atomic Energy Research Inst., Japan; Nagashima, Keisuke, Japan Atomic Energy Research Inst., Japan; Tobita, Kenji, Japan Atomic Energy Research Inst., Japan; Neyatani, Yuzuru, Japan Atomic Energy Research Inst., Japan; Ushigusa, Kenkichi, Japan Atomic Energy Research Inst., Japan; Nagashima, Akira, Japan Atomic Energy Research Inst., Japan; Kubo, Hirotaka, Japan Atomic Energy Research Inst., Japan; Ozeki, Takahisa, Japan Atomic Energy Research Inst., Japan; Yamamoto, Takumi, Japan Atomic Energy Research Inst., Japan; Hosogane, Nobuyuki, Japan Atomic Energy Research Inst., Japan; Kikuchi, Mitsuru, Japan Atomic Energy Research Inst., Japan; Nagami, Masayuki, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 76p; In Japanese

Report No.(s): JAERI-Research-97-023; DE97-750684; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The JT-60 Super Upgrade (JT-60SU) is a highly upgraded tokamak device of JT-60U for developing the steady-state fusion reactor and advanced tokamak operation in ITER. The device is planned to utilize the JT-60 facility fully and to minimize the necessary modification. The major radius is 4.8 m and the maximum plasma current is 10 MA. Neutral beam injection with 750 keV beam energy is the primary heating method. The machine is capable of steady-state operation with high density up to $8.8 \times 10^{19} \text{ m}^{-3}$ at 5 MA plasma current. The high operating density, around the Greenwald-limit, is critically important in order to achieve high bootstrap current fraction. Ballooning modes and low-n ideal modes were analyzed for steady-state operation including the bootstrap current. The current profile must be optimized to get high normalized beta up to 3. The plasma configuration with high triangularity was adopted in order to get good MHD stability and high energy confinement. A compact divertor was designed in order to get high space availability. The JT-60SU diagnostic system consists of main plasma and peripheral plasma diagnostics, which are basically composed of the existing diagnostics for JT-60U. YAG Thomson scattering system will be specially improved to provide electron density and temperature profiles for various plasma equilibria at a good spatial resolution and a high repetition rate (50 Hz). The diagnostic system also introduces magnetic probes for steady-state magnetic field measurements, micro-fission chambers and Penning gauges as new diagnostic tools. The field of view of each diagnostic and its basic requirements were determined.

DOE

Design Analysis; Tokamak Devices; Plasma Diagnostics; Plasma Radiation

19980011631 Japan Atomic Energy Research Inst., Dept. of Fusion Plasma Research, Tokyo, Japan

Determination of position on the measurement of electron temperature radial profile from electron cyclotron emission. Scaling of the apparent radial shift

Sato, Masayasu, Japan Atomic Energy Research Inst., Japan; Isei, Nobuaki, Japan Atomic Energy Research Inst., Japan; Isayama, Akihiko, Japan Atomic Energy Research Inst., Japan; Ishida, Sinichi, Japan Atomic Energy Research Inst., Japan; Mar. 1997; 64p; In Japanese

Report No.(s): JAERI-Research-97-011; DE97-750680; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Effect of relativistic frequency down-shift and optical thickness on the determination of the electron temperature profile from electron cyclotron emission in tokamak plasmas have been studied. Inclusion of relativistic and optical thickness effects results in a radial shift of the obtained electron temperature profile. In order to evaluate the shift for any tokamak, a scaling of the shift (Δr) is obtained: $\Delta r(m) = 0.0009 R(m) T_e(keV) (1 + 50/(4\tau))$ for $170 > \tau > 5$, where R is major radius, T_e is electron temperature, (τ) is the optical depth. Comparison between the scaling and the computational shifts for various devices are made, the good agreement between them is obtained within 2% of minor radius. Thus the scaling can be applied to any tokamak devices.

DOE

Tokamak Devices; Cyclotron Radiation; Plasma Diagnostics; Electron Energy

19980011634 Ecole Polytechnique Federale de Lausanne, Centre de Recherche en Physique des Plasma (CRPP), Switzerland

Effect of plasma shape on confinement and MHD behaviour in the TCV tokamak

Weisen, H., Ecole Polytechnique Federale de Lausanne, Switzerland; Moret, J. M., Ecole Polytechnique Federale de Lausanne, Switzerland; Franke, S., Ecole Polytechnique Federale de Lausanne, Switzerland; Furno, I., Ecole Polytechnique Federale de Lausanne, Switzerland; Martin, Y., Ecole Polytechnique Federale de Lausanne, Switzerland; Anton, M., Ecole Polytechnique Federale de Lausanne, Switzerland; Behn, R., Ecole Polytechnique Federale de Lausanne, Switzerland; Dutch, M., Ecole Polytechnique Federale de Lausanne, Switzerland; Duval, B. P., Ecole Polytechnique Federale de Lausanne, Switzerland; Hofmann, F., Ecole Polytechnique Federale de Lausanne, Switzerland; Joye, B., Ecole Polytechnique Federale de Lausanne, Switzerland; Nieswand, C., Ecole Polytechnique Federale de Lausanne, Switzerland; Pietrzyk, Z. A., Ecole Polytechnique Federale de Lausanne, Switzerland; VanToledo, W., Ecole Polytechnique Federale de Lausanne, Switzerland; Apr. 1997; 30p; In English

Report No.(s): LRP-571/97; DE97-633199; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The energy confinement time of TCV ohmic L-mode discharges depends strongly on plasma shape. For fixed average current and electron densities, confinement times increase with plasma elongation and decrease with (positive) plasma triangularity. This dependence can be explained by the geometrical effects of flux surface expansion and compression on the temperature gradients together with the effect of power degradation, without a need to invoke a shape dependence of the transport coefficients. A global factor of merit, the shape enhancement factor $H(\text{sub } S)$ is introduced to quantify this geometrical effect. The shape enhancement factor also has the potential to improve the description of the shape dependence in existing inter-device scaling laws. Modified versions of Neo-Alcator scaling and of Rebut-Lallia-Watkins scaling provide successful descriptions of ohmic L-mode confinement for a large variety of plasma shapes in TCV by making use of $H(\text{sub } S)$. MHD activity is also strongly dependent on plasma shape. Sawtooth amplitudes are largest at positive triangularity and sometimes vanish at negative triangularity, where the amplitude of MHD modes is highest. We show that the changes in MHD behaviour are to a large extent consequences of the confinement changes produced in these shaping experiments.

DOE

Plasmas (Physics); Plasma Drift; Tokamak Devices; Confinement; Time Dependence; Magnetohydrodynamics

19980011666 SRI International Corp., Menlo Park, CA USA

Efficient Generation of Volumetric Plasmas Final Report

Vidmar, Robert J., SRI International Corp., USA; Nov. 1997; 55p; In English

Contract(s)/Grant(s): F49620-95-C-0009

Report No.(s): AD-A332817; AFOSR-97-0698TR; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Sources that generate cubic meter volumes of plasma are of commercial importance for ionized gas chemistry, toxic waste remediation, and surface treatments. Efficient plasma production is necessary for minimizing the net power budget, system complexity, and overall cost. Two approaches to volumetric plasma generation were investigated. First, microchannel cooling applied to a foil electron beam 2 transmission window increases its heat dissipation capability to 2.5 kW/cm(exp 2) and beam current to 30 mA/cm(exp 2), which is a two to three order of magnitude increase in continuous beam flux and plasma production compared with a traditional window design. The cooling technique is robust and can be applied to other high heat dissipation applications such as an RF transmission window, chemical reactors, and VLSI cooling. The second approach investigated a plasma generated and sustained entirely by photons without relying on inefficient direct photoionization. A Penning ionization scheme utilizing mercury and cesium vapor was analyzed and proved to be feasible. To facilitate deep penetration of photons into mercury vapor, different isotopes of mercury were modeled in a mercury lamp and in the target gas to reduce the effective cross section for resonance line absorption. The extension of a Penning ionization approach to other gas species of commercial importance may be possible.

DTIC

Plasma Generators; Plasmas (Physics); Very Large Scale Integration; Photoionization; Electron Beams; Gas Composition; Ionized Gases; Mercury Vapor

19980011976 Boeing Defense and Space Group, Research and Technology, Kent, WA USA

Anode Current Attachment in Collisional Plasmas Final Report

Butler, G. W., Boeing Defense and Space Group, USA; Oct. 23, 1997; 19p; In English

Contract(s)/Grant(s): F49620-95-C-0031

Report No.(s): AD-A331723; AFOSR-TR-97-0585; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Improvements in arcjet performance are primarily limited by the anode's ability to process the energy densities associated with arc attachment. The motivation for this work was our lack of understanding of these processes. The more global objective was to develop an understanding of arc attachment physics and energy transfer to anode surfaces in collisional plasmas. A numerical multifluid approach was formulated to investigate the behavior of the plasma at an anode surface, taking into account the motion and interaction of electron, ion, and neutral fields with the solid conducting boundary. Attempts to validate the numerical algorithm have not yet proven successful. Two different approaches have been explored, but both have demonstrated numerically divergent solutions. Without the clear demonstration of success, efforts to compare with experimental data have been postponed. Continued work with this numerical approach will generate a physical correct and correlated approach to estimating the thermal loading due to the attachment of high intensity, high velocity arcs at near-atmospheric pressures. The results of this effort could not only be used to design arcjet electrodes, but also other high current devices, such as plasma switches and relays.

DTIC

Collisional Plasmas; Arc Jet Engines; Anodes

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SOLID-STATE PHYSICS

Includes superconductivity. For related information, see also 33 Electronics and Electrical Engineering and 36 Lasers and Masers.

19980009525 California Univ., Santa Barbara, CA USA

Ballistic Electron Emission Spectroscopy Study of Transport through Semiconductor Quantum Wells and Quantum Dots
Final Report, 15 Jul. 1994 - 14 Jul. 1997

Narayanamurti, Venkatesh, California Univ., USA; Sep. 01, 1997; 15p; In English

Contract(s)/Grant(s): F49620-94-I-0378; AF Proj. 2305

Report No.(s): AD-A329782; AFOSR-TR-97-0405; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report summarizes the development and use of Ballistic Electron Emission Microscopy (BEEM) for nondestructive, local characterization of semiconductor heterostructures. The technique has been applied for measuring heterojunction band offsets, for studying band structure effects in electron tunneling through double barrier resonant tunneling structures, and for imaging current flow through buried mesoscopic structures such as quantum dots (approx. 10 nm in size) and misfit dislocations 80 nm below the surface. Monte Carlo simulations of the transport have also been performed. The results suggest that BEEM is a powerful new low energy electron microscopy for materials physics study on the nm scale.

DTIC

Electron Emission; Electron Microscopy; Electron Tunneling; Heterojunctions; Monte Carlo Method; Quantum Dots; Quantum Wells; Semiconductors (Materials)

19980009528 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Physical Implications of Crystal Symmetry and Time Reversal

Michel, L., Institut des Hautes Etudes Scientifiques, France; Dec. 1996; 26p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-141279; IHES/P/96/80; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Crystals are complicated systems for physicists and the models used for their study are rather coarse approximations. However if a model has the full symmetry of the crystal, the predictions of this model will satisfy all predictions of symmetry; so some physicists think that they have nothing to learn from symmetry that they cannot discover by their model. The answer to this objection is simple. First, by its generality and precision, the study of the consequences of symmetry belongs to the general culture of physicists; in fact it is a handicap to ignore it. More particularly the authors shall show that some predictions, although very specific and detailed, are model independent. They must be known in order to evaluate the nature of the model predictions: which ones are only a verification of a simple and general theorem of mathematics. Only the other ones can be specific to the model.

NTIS

Crystals; Symmetry; Predictions; Time Functions

19980009535 Commissariat a l'Energie Atomique, Laboratoire Leon Brillouin (LLB), Gif-sur-Yvette, France

Activity report 1993-1994, Jan. 1993 - Dec. 1994 Rapport d'activite 1993-1994

May 1995; 371p; In French

Report No.(s): LLB-RA-1994; DE97-620963; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

This reports presents the Leon Brillouin Laboratory (LLB) activity during 1993-1994. Concerning the physico-chemical and biological systems, polymers are still a main field of the LLB. New ideas and experiments appeared also in the field water, ionic solids, polyelectrolyte and biologicals systems. Concerning structures and phase transitions, activity in the field of crystalline structures has been reinforced. Disordered systems, metallurgy and material fields were also developed. Concerning magnetism and superconductivity, important results were obtained.

DOE

Physical Chemistry; Phase Transformations

19980009642 Michigan Univ., Dept. of Electrical Engineering and Computer Science, Ann Arbor, MI USA

A Study of Impact Ionization and Breakdown Phenomena in SiGe Devices Final Report, 30 Jun. 1994 - 29 Jun. 1997

Bhattacharya, P., Michigan Univ., USA; Sep. 03, 1997; 22p; In English

Contract(s)/Grant(s): F49620-94-I-0404; AF Proj. 3484

Report No.(s): AD-A329784; AFOSR-TR-97-0391; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The spectral response and impact ionization coefficient ration of Si(1-x)Ge(x) have been determined. Measurements were made on p+-i-n+ diodes grown by solid/gas source molecular beam epitaxy. The diodes are characterized by reverse breakdown

voltages of 4-12V and dark currents of 20-170pA/micrometers². The long wavelength cut-off of the diodes increases from 1.2 micrometers to 1.6 micrometers as x increases from 0.08 to 1.0 with a maximum responsivity of 0.5 A/W in all the diodes tested. The ratio α/β varies from 3.3 to 0.3 in the same composition range, with $\alpha/\beta=1$ at x congruent 0.45. These results have important implications in the use of this material system in various photodetection applications. As part of this project we also investigated the problem of high-level n-type doping of Si and SiGe, which is required for high quality diodes. The use of supersonically injected pulses of phosphine to achieve uniform and high levels of n-type doping in Si during gas-source molecular beam epitaxy was demonstrated. Uniform n-type doping up to levels of 5×10^{19} cm⁻³ is obtained. SiGe/Si junction diodes made with this doping technique show good doping profiles and rectifying characteristics.

DTIC

Ionization Coefficients; Junction Diodes; Molecular Beam Epitaxy; Electric Potential

19980009649 Institut des Hautes Etudes Scientifiques, Bures-sur-Yvette, France

Electrons in a Lattice with an Incommensurate Potential

Benfatto, G., Rome Univ., Italy; Gentile, G., Institut des Hautes Etudes Scientifiques, France; Mastropietro, V., Rome Univ., Italy; Jan. 1997; 40p; In English; Figures in this document may not be legible in mic

Report No.(s): PB97-141246; IHES/P/97/04; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A system of fermions on a one-dimensional lattice, subject to a periodic potential whose period is incommensurate with the lattice spacing and verifies a diophantine condition, is studied. The Schwinger functions are obtained, and their asymptotic decay for large distances is exhibited for values of the Fermi momentum which are multiple of the potential period.

NTIS

Diophantine Equation; Decomposition; Fermions; Momentum

19980009797 Scientific Research Associates, Inc., Glastonbury, CT USA

Numerical Studies of Physics and Operation of LTG Materials and Devices Final Report, 15 Mar. 1994 - 14 Mar. 1997

Grubin, Harold L., Scientific Research Associates, Inc., USA; Aug. 1997; 31p; In English

Contract(s)/Grant(s): F49620-94-C-0024; AF Proj. 2305

Report No.(s): AD-A330585; SRA-R97-9137-F; AFOSR-97-0530TR; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document summarizes Scientific Research Associates, Inc., (SRA) low temperature material studies, carried out under U.S. Air Force Office of Scientific Research (AFOSR) Contract F49620-94-C-0024. The study summarizes a model that was developed that is consistent with present Low Temperature Growth (LTG) experimental studies. SRA's study included one-dimensional transient simulations and two-dimensional time independent constrained geometric studies. The broad aspects of the study indicate that annealed LTG GaAs is best represented as material containing precipitates with characteristics of embedded Schottky barriers. These embedded barriers are, in turn surrounded by defects. Carrier transport in annealed LTG GaAs is between the precipitates, with the details determined by the precipitate spacing, the concentration of traps, and properties of the surrounding traps. The two-dimensional studies provide numerical evidence that carriers travel between precipitates and are influenced, to first order, by the properties of the surrounding traps.

DTIC

Gallium Arsenides; Carrier Mobility; Numerical Analysis; Low Temperature

19980009870 California Univ., Dept. of Computer Engineering, Santa Barbara, CA USA

A Novel mm-Wave Heterojunction JFET Technology with Suppressed Hole Injection Final Report, 15 Jan. 1993 - 14 Jan. 1996

Mishra, Umesh K., California Univ., USA; Shealy, Jeffrey B., California Univ., USA; Sep. 1996; 185p; In English

Contract(s)/Grant(s): DAAH04-93-G-0033

Report No.(s): AD-A332544; ARO-31136.2-EL-SDI; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

We have developed a device technology using n-AlInAs/GaInAs on InP substrates, where the gate technology incorporates a p-n junction barrier. The p-n junction exists between an undepleted p-type surface layer (p(+)-GaInAs) and the two-dimensional electron gas (2DEG) in the GaInAs channel. The p(+)-2DEG junction provides a sufficiently high gate barrier that exhibits low gate leakage current and a high breakdown voltage. At the same time, the fixed gate-to-channel separation (solely determined by the MBE growth) leads to a reproducible gate barrier height, resulting in high threshold voltage uniformity ($\sigma(V_{th})=13.7$ mV). The junction barrier gate technology is the best choice of the three available gate technologies (namely insulator barrier gate, Schottky barrier gate, and the p-n junction barrier gate) for InP-based FETs. The low parasitic resistance and low gate leakage current produced state-of-the-art minimum noise figure (F_{min}) and associated gain (G_a) of 0.45 dB and 14.5

dB at 12 GHz. The combination of reduced gatelength (0.2 micrometers) and reduced parasitic transit delay translated into a unity gain cut-off frequency (f_t) of 105 GHz. The low input resistance (due to high acceptor doping in the gate layer) and high $C(\text{sub gs})/C(\text{sub gd})$ ratio (due to a high aspect ratio design) of the JHEMT improved the unity power gain cut-off frequency ($f(\text{sub max})$) to 220 GHz. This is the highest $f(\text{sub max})$ ever reported for a junction-barrier FET (JFET).

DTIC

Millimeter Waves; Technologies; Holes (Electron Deficiencies); Heterojunctions

19980010120 California Univ., Dept. of Electrical Engineering, Los Angeles, CA USA

Proposal for Partial Support of the 9th International Molecular Beam Epitaxy (MBE) Conference *Final Report, 1 Jul. 1996 - 30 Jun. 1997*

Wang, Kang L., California Univ., USA; Aug. 1996; 462p; In English

Contract(s)/Grant(s): F49620-96-1-0303; AF Proj. 2305

Report No.(s): AD-A329642; AFOSR-TR-97-0323; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

The Ninth International Conference on Molecular Beam Epitaxy (MBE-IX) was held on the campus of the Pepperdine University, Malibu, California, from August 5 to 9, 1996. In this conference, the major theme highlighted the success of MBE technology to the state that it is now a commercial tool for manufacturing integrated circuits. The topics critical to the development and advance of MBE were covered and they ranged from material aspects of growth, processing and characterization to relevant physics and device properties of the resulting films and structures. Specific topics included growth and growth mechanisms of MBE, characterization of MBE films and interfaces, advances in MBE and related techniques, such as MEE, GSMBE, and MOMBE Physics and MBE grown devices and structures.

DTIC

Molecular Beam Epitaxy; Manufacturing; Integrated Circuits

19980010609 Virginia Univ., Charlottesville, VA USA

Monte Carlo Simulation of Mercury Cadmium Telluride *Final Report, 1 Jun. 1994 - 31 May 1996*

Shur, M., Virginia Univ., USA; Gelmont, B., Virginia Univ., USA; Sep. 16, 1997; 5p; In English

Contract(s)/Grant(s): DAAH04-94-G-0187

Report No.(s): AD-A332550; TR-5-25033; ARO-32476.9-EL; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

We derived basic equations for basic electron scattering processes in narrow band gap semiconductors. However even in the case when the relaxation time approximation can be introduced a set of cumbersome integrals has to be numerically calculated for intermediate degeneracy of an electron gas which is characteristic for narrow band gap semiconductors at liquid nitrogen temperature. As to the scattering by optical phonons the standard relaxation time approximation is, in general, not applicable.

DTIC

Monte Carlo Method; Simulation; Semiconductors (Materials); Mercury Cadmium Tellurides

19980010780 State Univ. of Southeast Missouri, Dept. of Physics, Cape Girardeau, MO USA

Microwave Measurements of the Dielectric Relaxation in Different Grain Size Crystals of BaTiO₃

Dahiya, Jai N., State Univ. of Southeast Missouri, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 485-496; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

This experiment is a continuation of the dielectric properties of the crystals of barium titanate at microwave frequencies. A microwave resonant cavity is used to study the dielectric relaxation in the different size crystals of BaTiO₃. Various fine sized crystals of this material are placed in the resonant cavity that is perturbed at a fixed frequency. The temperature of the cavity is then allowed to change and different phases of the crystals of barium titanate are observed in terms of dielectric relaxation. The dielectric constant of these crystals is calculated using Slater's perturbation equations. The grain size seems to effect the dielectric constant significantly at the phase transition temperatures. Debye's equations are used to calculate the relaxation times of these crystals.

Author

Barium Titanates; Ferroelectric Materials; Permittivity; Dielectric Properties; Relaxation (Mechanics); Grain Size

19980010815 International Centre for Theoretical Physics, Trieste, Italy

Resonant tunneling and persistent current of a non-interacting and weakly interacting one-dimensional electron gas

Krive, I. V., Academy of Sciences of the Ukraine, Ukraine; Sandstroem, P., Chalmers Univ. of Technology, Sweden; Jan. 1997; 18p; In English

Contract(s)/Grant(s): INTAS-94-3962

Report No.(s): IC-97/3; DE97-634329; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

The persistent current for a one-dimensional ring with two tunneling barriers is considered in the limit of weakly interacting electrons. In addition to small off-resonance current, there are two kinds of resonant behaviour; (1) a current independent of the barrier transparency (true resonance) and (2) a current analogous to the one for a ring with only single barrier ('semi'-resonance). For a given barrier transparency the realization of this or that type of resonant behaviour depends both on the geometrical factor (the ratio of interbarrier distance to a ring circumference) and on the strength of electron-electron interaction. It is shown that repulsive interaction favours the 'semi'-resonance behaviour. For a small barrier transparency the 'semi'-resonance peaks are easily washed out by temperature whereas the true resonance peaks survive.

DOE

Resonant Tunneling; Electron Gas; Electron Beams

19980010909 Princeton Resources, Inc., NJ USA

Proceedings of the International Symposium on Integrated Ferroelectrics, Part 1

Taylor, G. W., Princeton Resources, Inc., USA; Dimos, D. B., Princeton Resources, Inc., USA; Tuttle, B. A., Princeton Resources, Inc., USA; Sep. 1997; 562p; In English; 9th, 3-5 Mar. 1997, Santa Fe, New Mexico, USA

Report No.(s): PB98-109689; No Copyright; Avail: CASI; A24, Hardcopy; A04, Microfiche

The 1997 meeting was the largest to date with respect to both the number of abstracts submitted (161) and the number of attendees. Both of these are indicative of the maturation of the field of ferroelectric thin films. The maturation was also demonstrated by the predominance of industrially sponsored research in the main technology areas (NVRAMs and DRAMs), especially in the far east, as opposed to the federally funded research that drove the field several years ago. These proceedings also show the increasingly wide variety of applications being developed based on perovskite thin films. These applications include integrated decoupling capacitors, tunable microwave capacitors, piezoelectric devices, and integrated pyroelectric detectors. Helping to drive the application development efforts is the increased understanding of the physical properties of these materials, such as fatigue and imprint, the device integration issues and the wide range of fabrication techniques available. These proceedings contain roughly half of the papers presented at the 9th ISIF and together provide a fairly complete view of the field.

NTIS

Ferroelectric Materials; Conferences

19980010950 California Univ., San Diego, La Jolla, CA USA

Low-Temperature Grown 3-5 Semiconductors Final Report, 1 Jun. 1996 - 31 May 1997

Tu, Charles W., California Univ., San Diego, USA; Nov. 1997; 2p; In English

Contract(s)/Grant(s): F49620-93-I-0367; AF Proj. 3484

Report No.(s): AD-A332147; AFOSR-97-0608TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

A new approach for n-type modulation doping in In-based heterostructures is proposed where intrinsic defects from low-temperature (LT) grown InP are utilized to provide charge carriers without an external shallow impurity doping source. The success of this approach is demonstrated by results from InGaAs/LT-InP heterostructures, where doping is provided by P(In) antisites, introduced during off stoichiometric LT growth of InP. Photoluminescence in a magnetic field and Shubnikov de Haas oscillations are applied for characterizing the electronic structure and recombination mechanisms. The efficiency of electron transfer and quantum mobility of a two dimensional electron gas formed near the heterointerface is shown to be much higher as compared to traditional extrinsic doping

DTIC

N-Type Semiconductors; Modulation Doping; Crystal Growth

19980010958 SKION Corp., Hoboken, NJ USA

Optimization of Properties of a New Material for Electronic and Magnetic Applications, 14 May - 14 Dec. 1997

Kim, S. I., SKION Corp., USA; Oct. 14, 1997; 3p; In English

Contract(s)/Grant(s): N00014-97-C-0209

Report No.(s): AD-A331339; BMDO-97-014; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Samples of MnAs/GaAs films have been prepared by molecular beam epitaxy with five different thicknesses, 200, 100, 50, 25 and 12.5 nm. The 200 nm film thickness was confirmed by optical microscopy and the 50 nm film was measured by on-edge high resolution scanning electron microscopy. The crystal structures of all films were determined by x-ray diffraction. In earlier work, two structures were found, which I call type A and type B. The 100 nm film is mainly type A while the others are entirely

or largely type B. The magnetooptic Kerr effect has been used to measure the hysteresis curves of all samples. In some films a detailed study was made of the dependence of hysteresis behavior on direction of applied magnetic field. The films have large magnetizations and square hysteresis curves for the most part. Quite unexpectedly, the films have their magnetic easy and hard directions oriented the same way as in type A films, at ninety degrees to the type B directions found earlier. While the magnetizations are quite large, the coercive magnetic fields are larger than in the earlier films, i.e., these films are somewhat harder magnetically, which is advantageous for some applications. Additional films will be grown soon that are much thinner since we are interested in the thinnest films that are still ferromagnetic. We are now going to measure the effects of electric fields on the Kerr effect in the films. The earlier films were grown using a source of As₂ while the present apparatus has a source of As₄. The growth kinetics are different, but we now can readily grow type B structures. We might also now be able to grow type A, which would be preferred since its structure is simpler. In the next few weeks, we will very likely find out if increasing the electric field effects will work.

DTIC

Crystal Structure; Electric Fields; Ferromagnetic Materials; Magneto-Optics; Microscopy; Molecular Beam Epitaxy; Scanning Electron Microscopy; X Ray Diffraction

19980010966 North Carolina State Univ., Dept. of Materials Science and Engineering, Raleigh, NC USA

Defects and Impurities in 4H- and 6H-SiC Homoepitaxial Layers: Identification, Origin, Effect on Properties of Ohmic Contacts and Insulating Layers and Reduction *Quarterly Report, 1 Jul. - 30 Sep. 1997*

Davis, R. F., North Carolina State Univ., USA; Aboelfotoh, M. O., North Carolina State Univ., USA; Baglia, B. J., North Carolina State Univ., USA; Nemanich, R. J., North Carolina State Univ., USA; Benjamin, M. C., North Carolina State Univ., USA; Jarrendahl, K., North Carolina State Univ., USA; King, S. W., North Carolina State Univ., USA; Smith, S., North Carolina State Univ., USA; Zheleva, T., North Carolina State Univ., USA; Sep. 1997; 40p; In English

Contract(s)/Grant(s): N00014-95-1-1080

Report No.(s): AD-A331740; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Aluminum nitride (AlN) thin films with very smooth surfaces have been grown by gas-source molecular beam epitaxy on 4H- and 6H-SiC substrates. Streaked reflection high energy electron diffraction patterns and reconstructions of the AlN surfaces indicated smooth films. Atomic force microscopy (AFM) and transmission electron microscopy (TEM) showed root mean square values less than or equal 1 nm and very flat surfaces, respectively. X-ray diffraction showed the films to be highly c-axis oriented and single phase. Major impurities in the AlN films were oxygen and carbon, as revealed by secondary ion mass spectrometry. A correlation has been found between the types and the distributions of the dominant defects, namely, micropipes and screw dislocations using optical microscopy, scanning electron microscopy, AFM, synchrotron white beam x-ray topography, and electron beam induced current (EBIC) studies. A ridge-type structure of the core of the micropipes, related to the growth front flow direction was observed with AFM. Triangular micro inclusions associated with the cubic 3C-SiC polytype (beta-SiC) were detected. EBIC studies revealed various types of electrically active defect regions, related to the beta-SiC phase and randomly distributed within the wafers and across different Schottky diodes. X-ray photoelectron spectroscopy, Auger electron spectroscopy (AES), low energy electron diffraction (LEED), and temperature programmed desorption (TPD) revealed that exposure of 6H-SiC to atomic hydrogen selectively removes Si from the surface and converts the (3x3) surface to a (1x1) surface. Additional etching of this surface was indicated by the reduction in the Si LVV/C KLL ratio in AES from 1.3 to 0.4 following exposure of (3x3) surfaces to a remote rf H plasma.

DTIC

Aluminum Nitrides; Atomic Force Microscopy; Molecular Beam Epitaxy; Scanning Electron Microscopy; Thin Films; X Ray Diffraction; Auger Spectroscopy; Electron Diffraction; Photoelectron Spectroscopy

19980010994 Imperial Coll. of Science Technology and Medicine, Dept. of Materials, London, UK

Generation of Mathematical Rules Governing Cellular Automata (CA) Predictions of Microstructural Evolution *Final Report*

Grimes, Robin W., Imperial Coll. of Science Technology and Medicine, UK; Lee, Peter D., Imperial Coll. of Science Technology and Medicine, UK; Zacate, Matthew O., Imperial Coll. of Science Technology and Medicine, UK; Sep. 1997; 23p; In English Contract(s)/Grant(s): F61708-96-W-0300

Report No.(s): AD-A332603; EOARD-SPC-96-4088; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report results from a contract tasking Imperial College, Department of Materials as follows: The contractor will be required to accomplish the following tasks: (1) prepare preliminary report outlining the primary direction of research and structure

for interim report and (2) prepare a detailed interim report on rules governing cellular automata simulations of microstructural evolution and participate in an international forum on intelligent processing and manufacturing of materials.

DTIC

Computerized Simulation; Automata Theory

19980011518 NASA Langley Research Center, Hampton, VA USA

Compositional Effects on Electromechanical Degradation of RAINBOW Actuators

Dausch, David E., NASA Langley Research Center, USA; Wise, Stephanie A., NASA Langley Research Center, USA; Jan. 1998; 10p; In English

Contract(s)/Grant(s): RTOP-505-63-50-20

Report No.(s): NASA/TM-98-206282; L-17629; NAS 1.15:206282; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The effect of ceramic composition on the electromechanical displacement degradation of RAINBOW (Reduced and Internally Biased Oxide Wafer) actuators was investigated. RAINBOWs were fabricated from commercially available PZT-5H and PZT-5A piezoelectric disks as well as from tape cast PLZT piezoelectric 7/65/35 and electrostrictive 9/65/35 compositions. Displacement properties were measured at low electric fields (10 to 13 kV/cm) under loads of 0 to 500 g, and displacement degradation as a function of time was observed over 107 cycles. The PZT-5A and PLZT 9/65/35 compositions exhibited minimal decrease in displacement when load was applied. Furthermore, these compositions retained approximately 65 percent of their initial displacement after $10(\exp 7)$ cycles under a load of 300 g. PZT-5H and PLZT 7/65/35 degraded completely under these conditions.

Author

Actuators; Ceramics; Displacement; Degradation

19980011675 Massachusetts Inst. of Tech., Research Lab. of Electronics, Cambridge, MA USA

JSEP Fellowship: Mirang Yoon Final Report, 1 Mar. 1991 - 31 May 1997

Mochrie, Simon G., Massachusetts Inst. of Tech., USA; Allen, Johnathan, Massachusetts Inst. of Tech., USA; Dec. 12, 1997; 4p; In English

Contract(s)/Grant(s): N00014-91-J-1581

Report No.(s): AD-A332898; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

The remarkably well-ordered morphology of faceted Si(113) surfaces was discovered under JSEP sponsorship in 1994 and has since been the subject of extensive research. In past years, our quantitative characterization of the equilibrium thermal behavior has validated the description of thermal faceting of stepped surfaces as a phase-separation of orientational phases. The construction of orientational phase diagram was performed with unprecedented precision, which enabled fine distinctions to be made between the phase separation of stepped Si(113) surfaces and that of other semiconductor and metal surfaces. Namely, the phase separation of stepped Si(113) surfaces is effected by the competition of a long-ranged repulsion between steps and a short-ranged attraction, a novel mechanism of current theoretical interest. In the 1996-1997 academic year, we have concluded the extension of our studies of the orientational phase diagram into previously unexplored azimuthal orientations vicinal to (113). Faceting transitions are observed on all surface orientations studied, which commonly are accompanied by anomalous step fluctuations and share similar characteristics of the orientational phase boundary. However, due to the strong anisotropy inherent to crystal surfaces, the transition temperatures for different azimuths are very different. We expect these refined observations to be accommodated in recently proposed theories of thermal faceting.

DTIC

Silicon; Crystal Surfaces; Metal Surfaces; Phase Diagrams; Semiconductors (Materials); Epitaxy

19980011690 California Univ., Center for Pure and Applied Mathematics, Berkeley, CA USA

Numerical Modelling of Crystal Growth Progress Report, 1 Aug. 1995 - 31 Jul. 1996

Strain, John, California Univ., USA; Sep. 01, 1996; 8p; In English

Contract(s)/Grant(s): F49620-93-I-0521

Report No.(s): AD-A332604; AFOSR-TR-97-0628; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This grant supported research by two University of California Berkeley graduate students on innovative numerical methods for flows around complex boundaries such as occur in solidification from the melt. New two-dimensional magnetization-based methods for complex fluid flows were developed and analyzed. New adaptive finite difference methods for simulation of the fluid flow in Czochralski growth were implemented and tested.

DTIC

Fluid Flow; Finite Difference Theory; Czochralski Method

THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; theoretical physics; and Bose and Fermi statistics. For related information see also 25 Inorganic and Physical Chemistry and 34 Fluid Mechanics and Heat Transfer.

19980009264 National Inst. of Standards and Technology, Gaithersburg, MD USA

Convective Boiling and Condensation Heat Transfer with a Twisted-Tape Insert for R12, R22, R152a, R134a, R290, R32/R134a, R32/R152a, R290/R134a, R134a/R600a

Kedzierski, M. A., National Inst. of Standards and Technology, USA; Kim, M. S., Seoul National Univ., Korea, Republic of; Jan. 1997; 98p; In English

Report No.(s): PB97-140594; NISTIR-5905; No Copyright; Avail: CASI; A05, Hardcopy; A02, Microfiche

This paper presents measured local-averaged heat-transfer coefficients for in-tube convective boiling and condensation of several possible alternative refrigerants with a twisted-tape insert. The heat transfer performance of five single component and two azeotropic refrigerants are examined: R12, R22, R152a, R134a, 290, R290/R134a, R134a/R600a. Also, the performance of two zeotropic refrigerant mixtures - R32/R134a, and R32/R152a - were examined at approximately five different mass compositions of R32. Table 1 presents the various percent mass compositions of R32 at which the zeotropes were tested. The heat transfer tests of the various working fluids were used in an attempt to develop universal-fluid evaporative and condensing heat transfer correlations.

NTIS

Boiling; Heat Transfer; Convective Heat Transfer; Heat Transfer Coefficients; Refrigerants; Inserts

19980009729 Jet Propulsion Lab., California Inst. of Tech., Pasadena, CA USA

Spacecraft Tests of General Relativity

Anderson, John D., Jet Propulsion Lab., California Inst. of Tech., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 29-32; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A01, Hardcopy; A03, Microfiche

Current spacecraft tests of general relativity depend on coherent radio tracking referred to atomic frequency standards at the ground stations. This paper addresses the possibility of improved tests using essentially the current system, but with the added possibility of a space-borne atomic clock. Outside of the obvious measurement of the gravitational frequency shift of the spacecraft clock, a successor to the suborbital flight of a Scout D rocket in 1976 (GP-A Project), other metric tests would benefit most directly by a possible improved sensitivity for the reduced coherent data. For purposes of illustration, two possible missions are discussed. The first is a highly eccentric Earth orbiter, and the second a solar-conjunction experiment to measure the Shapiro time delay using coherent Doppler data instead of the conventional ranging modulation.

Author

Conferences; Atomic Clocks; Flight Tests; Frequency Standards; Frequency Measurement

19980009731 New Mexico Univ., Center for Advanced Studies, Albuquerque, NM USA

Clocks and General Relativity

Mashhoon, Bahram, Missouri Univ., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 41-48; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The basic role of the hypothesis of locality in the theory of relativity is discussed. A consequence of this assumption is the accelerated clock hypothesis of ACH are investigated and compared with experimental data. The possibility of using highly accurate docks to test various aspects of general relativity is emphasized.

Author

Clocks; Relativity; Hypotheses

19980009755 Boston Univ., Boston, MA USA

An Overview of the Lattice-Gas Research Collaboration Between the Boston University Center for Computational Science and the Geophysics Directorate of Phillips Lab. Final Report, 1 Apr. 1995 - 1 Apr. 1997

Boghosian, Bruce M., Boston Univ., USA; Oct. 01, 1997; 28p; In English

Report No.(s): AD-A332089; BU-CCS-970902; AFOSR-TR-97-0672; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Center for Computational Science at Boston University provided theoretical and computational support to the Lattice-Gas Theory and Computation group at the Geophysics Directorate of Phillips Laboratory (AFOSR task 2304CP). Twelve publica-

tions have resulted from this effort, as well as the sponsorship of the Sixth International Conference on Discrete Models for Fluid Mechanics and the preparation of the proceedings of that meeting as a special issue of the International Journal of Modern Physics C. In addition to applying lattice-gas algorithms to systems of complex fluids and droplets, the work has resulted in two significant extensions of the lattice-gas algorithm: These are integer lattice gases which are proving to be an important methodology for the matching of microscopic, particulate, kinetic descriptions to macroscopic, continuum hydrodynamics, and quantum lattice gases which provide a paradigm for the simulation of physical systems on quantum computers. Moreover, we have shown that lattice-gas algorithms can be among the most efficient methods of simulating certain systems of interest in materials science, such as immiscible and amphiphilic fluids.

DTIC

Quantum Theory; Computational Fluid Dynamics; Lattice Parameters; Mathematical Models

19980010751 Norfolk State Univ., Center for Materials Research, VA USA

Visual Quantum Mechanics: A Materials Approach

Chaudhury, Raj S., Norfolk State Univ., USA; Rebello, Sanjay N., Kansas State Univ., USA; Escalada, Larry, Kansas State Univ., USA; Zollman, Dean, Kansas State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 153-162; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The Visual Quantum Mechanics (VQM) project is developing materials to help students learn quantum physics through an investigation of the inner workings of simple, every-day devices which operate on quantum principles. Widely available semiconductor devices such as LEDs offer exciting possibilities as inexpensive demonstrations of quantum phenomena. A combination of hands-on activities, written exercises and computer simulations is used as an alternative to traditional mathematics-intensive approaches.

Author

Computerized Simulation; Quantum Mechanics; Display Devices

19980010820 Carnegie-Mellon Univ., Pittsburgh, PA USA

Stability and Thermal Influences in Continuum Mechanics and Materials Science Final Report

Gurtin, Morton E., Carnegie-Mellon Univ., USA; Aug. 25, 1997; 6p; In English

Contract(s)/Grant(s): DAAH04-94-G-0224

Report No.(s): AD-A332571; ARO-32563.18-MA; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

Work continued on order parameter theories of two-phase continua. This work differs from past work in the introduction a balance law for microforces associated with the kinematics of the order parameter and the use of the second-law to develop constitutive equations. A general framework for dynamical fracture is developed based on the notion of configurational forces in conjunction with a mechanical version of the second law. Here, as with other work done on this project, configurational forces are viewed as basic objects consistent with their own force balance. This balance yields a kinetic relation for the evolution of straight cracks. Kinking and curving of cracks is based on the requirement that the crack propagate in the direction that maximizes the energy dissipation. Explicit relations for the initial kink angle and the subsequent direction of propagation are given. A continuum framework is developed for recrystallization. The driving force is the energy stored in dislocation substructures, characterized with the aid of a scalar measure, the dislocation content. A relation is obtained characterizing the efficiency with which dislocation substructure is eliminated by moving grain boundaries.

DTIC

Continuum Mechanics; Temperature Effects; Fracturing; Crack Propagation

19980010859 Modena Univ., Ist di Fisica, Italy

Application of the Wigner-Function Formulation to Mesoscopic Systems in Presence of Electron-Phonon Interaction

Jacoboni, C., Modena Univ., Italy; Abramo, A., Modena Univ., Italy; Bordone, P., Modena Univ., Italy; Brunetti, R., Modena Univ., Italy; Pascoli, M., Modena Univ., Italy; Jul. 21, 1997; 16p; In English

Contract(s)/Grant(s): N68171-96-C-9089

Report No.(s): AD-A331508; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A theoretical and computational analysis of the quantum dynamics of charge carriers in presence of electron-phonon interaction based on the Wigner function is here applied to the study of transport in mesoscopic systems. Numerical applications are shown for (a) a wave packet scattering with phonons while crossing a potential profile and (b) electrons scattering with phonons in a finite device with open boundary conditions.

DTIC

Analysis (Mathematics); Boundary Conditions; Phonons; Scattering; Wave Packets

19980010872 Modena Univ., Ist di Fisica, Italy

Wave-Packet Analysis of Electron-Phonon Interaction in the Wigner Formalism

Brunetti, R., Modena Univ., Italy; Jacoboni, C., Modena Univ., Italy; Jan. 1996; 20p; In English
Report No.(s): AD-A331431; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

A theoretical and computational analysis is presented of the motion of a single one-dimensional electron, represented by a wave packet of given average momentum and position, in a fixed potential profile in presence of electron phonon interaction. The electron propagation can take place with or without an external bias. A perturbative approach is used in the theoretical framework of the Wigner function accounting for the continuous quantum dynamical evolution of the scattering process. The unperturbed hamiltonian contains the one-dimensional potential profile and the external field, while the electron phonon coupling potential is considered as the perturbation hamiltonian. Computational results are presented for the case of an electron propagating (1) without applied forces, (2) through a region where a uniform electric field is applied, and (3) in a double barrier potential in resonance conditions due to the relevance of these physical cases for practical applications.

DTIC

Analysis (Mathematics); Electric Fields; Electron Phonon Interactions; Hamiltonian Functions; Momentum; Perturbation; Wave Packets

19980010883 New Mexico Univ., Office of Research Admin., Albuquerque, NM USA

Measurement of the Linewidth Enhancement Factor at High Excitation Levels Final Report, 31 Aug. 1994 - 30 Aug. 1997

Brueck, S. R. J., New Mexico Univ., USA; Aug. 1997; 19p; In English
Contract(s)/Grant(s): F49620-94-I-0301; AF Proj. 3483

Report No.(s): AD-A332585; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We have undertaken the first systematic investigation of the impact of the quantum well epitaxial structure on the alpha-parameter in broad-area quantum well lasers. Modal gain, carrier-induced refractive index change, and a parameter have been measured in quantum wells of varying width, depth, and material composition using four structures: 60 Å and 500 Å GaAs quantum wells, referred to as 'narrow' and 'wide', and 60 Å InGaAs wells with AlGaAs barriers of two different aluminum concentrations giving 'shallow' and 'deep' wells.

DTIC

Quantum Wells; Epitaxy; Quantum Well Lasers

19980010944 Centro di Cultura Scientifica A. Volto, Como, Italy

Quantum Chaos and Mesoscopic Systems Final Report, Jan. - Mar. 1997

Casati, Giulio, Centro di Cultura Scientifica A. Volto, Italy; Jul. 1997; 32p; In English
Contract(s)/Grant(s): N68171-96-C-9039

Report No.(s): AD-A331446; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The interplay of classical chaotic properties and of quantum coherence effects is crucially important in mesoscopic physics, as it gives rise to transport fluctuations and quantum localization. We have studied both effects in different models. The results we have obtained are potentially relevant to all fields of Quantum Chaology, with possible experimental applications in the domains of Atomic Physics, Mesoscopic Physics, and Classical wave propagation (e.g. acoustic, microwave and optical resonators).

DTIC

Atomic Physics; Microwave Oscillators; Optical Resonators; Position (Location); Wave Propagation

19980010985 International Centre for Theoretical Physics, Trieste, Italy

One-probe homodyne reconstruction of quantum state

Mogilevsev, D., Academy of Sciences of the Belarus, Belarus; Mar. 1997; 6p; In English; Sponsored in part by Belarus Foundation for Fundamental Researches.

Contract(s)/Grant(s): MP-96-38

Report No.(s): IC-97/25; DE97-635726; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche; US Sales Only; US Sales Only

In this work I demonstrate a possibility to reconstruct a density matrix of signal state using the standard homodyne scheme with fixed position of beam-splitter and identical probe states for both ideal and non-ideal detectors. It is also shown that for non-ideal detection it is possible to make the reconstruction measuring only the probability of no photon registration on both detectors.

DOE

Probability Theory; Quantum Mechanics; Radiation Detectors

80
SOCIAL SCIENCES (GENERAL)

Includes educational matters.

19980010265 Nebraska Univ., Omaha, NE USA

Aviation Education: Perceptions of Airport Consultants

Bowen, Brent, Editor, Nebraska Univ., USA; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 64-80; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

The necessity for advanced training in aviation has prompted a few universities to establish graduate programs in aviation. Although several masters aviation programs are now well established, they do not have a common core curriculum. This article reports the findings of a study designed to learn more about the educational needs of one segment of the aviation industry - the airport consulting business. Airport consultants were first asked to evaluate the relevance of courses offered in an existing MPA program. They were then asked to evaluate sixteen fields of academic study in terms of importance in preparing entry-level employees for a career in airport consulting

Author

Aircraft Industry; Airports; Education; Personnel; Occupation; Commerce

19980010266 Bowling Green State Univ., OH USA

Curriculum Design Issues in Developing a Doctor of Philosophy Program in Aeronology

Johnson, Jeffrey A., Editor, Bowling Green State Univ., USA; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 81-92; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

A Ph.D. degree program in the non-engineering aeronautical/aerospace sciences (aeronology) will likely be required in the near future to meet the increasing demands for qualified faculty, administrators, and industry representatives within the aviation/aerospace field. Since there is no known Ph.D. degree program dedicated exclusively to a non-engineering aeronautical/aerospace science discipline worldwide, a study was conducted to design and propose a Ph.D. curriculum model based upon two curriculum models a research/practitioner model and a practitioner model. A survey questionnaire was sent to 105 U.S. University Aviation Association (UAA) institutional members to solicit their professional expertise. The study found that support for each of the two curriculum models was approximately equal although overall support for both models was not overwhelmingly high. However, a majority of the respondents did support several curriculum design attributes in developing a new Ph.D program. These attributes included a computer science requirement, an oral communication requirement, a core program requirement, and a global education awareness requirement.

Author

Aerospace Engineering; Aeronautics; Education; Aircraft Industry; Universities

19980010749 NASA Langley Research Center, Hampton, VA USA

Next Generation Multimedia Distributed Data Base Systems

Pendleton, Stuart E., NASA Langley Research Center, USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 125-130; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A02, Hardcopy; A04, Microfiche

The paradigm of client/server computing is changing. The model of a server running a monolithic application and supporting clients at the desktop is giving way to a different model that blurs the line between client and server. We are on the verge of plunging into the next generation of computing technology--distributed object-oriented computing. This is not only a change in requirements but a change in opportunities, and requires a new way of thinking for Information System (IS) developers. The information system demands caused by global competition are requiring even more access to decision making tools. Simply, object-oriented technology has been developed to supersede the current design process of information systems which is not capable of handling next generation multimedia.

Derived from text

Object-Oriented Programming; Multimedia; Information Systems; Distributed Processing

19980010772 Boeing Commercial Airplane Co., Boeing Materials Technology, Seattle, WA USA

National Educators' Workshop 1997 Preview

Smith, Brian, Boeing Commercial Airplane Co., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 371-405; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

The overview of this presentation includes: A brief background on Boeing; An overview of the share materials and process focus areas; and share and collect inputs for 1997 plenary sessions and workshops.

Derived from text

Education; Aircraft Industry

19980010774 Norfolk State Univ., Center for Materials Research, VA USA

A 'Problem Based Learning' Approach to Reflection and Refraction

Wilkerson, Amy, Norfolk State Univ., USA; Self, Donna, Norfolk State Univ., USA; Rodriguez, Waldo J., Norfolk State Univ., USA; Ries, Heidi R., Norfolk State Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 417-429; In English; Also announced as 19980010742

Contract(s)/Grant(s): DE-FG01-94EW-11493; No Copyright; Avail: CASI; A03, Hardcopy; A04, Microfiche

Businesses are demanding that their employees have the intellectual flexibility necessary to decipher new problems as they occur and unravel serious questions without duplicating existing available information. Innovative methods, including problem based learning (PBL), are successful approaches to teaching soft skills. Problem based learning takes advantage of one of the simplest options we have to understanding and committing new material to memory. It relates what we are learning to something we already know. In the problem based learning paradigm, the instructor creates a scenario in which the students participate until they fully understand the target concept. Once the situation is established, the instructor is responsible for acting as a guide throughout the problem solving process, while allowing the students to take the lead in developing a solution. The instructor may coach, question, answer, and point out resources when necessary to facilitate the forward motion of the process, but should not dominate the discussion. Sometimes there will be no right answer or, from time to time, there may be many right answers. Learning a new way of thinking is the objective of the soft problem solving skills process known as problem based learning. While problem based learning has long been used to train doctors and has recently attracted interest in pre-college education, we have adapted the technique for college level technical and science education. In the example supplied in this paper, the problem based learning experience is designed to build student interest prior to conducting an experiment, observing a demonstration, or using traditional teaching methods.

Derived from text

Education; Problem Solving; Learning Theory; Learning Curves

19980010782 North Carolina State Univ., Materials Science and Engineering Dept., Raleigh, NC USA

Impact of Multimedia and Network Services on an Introductory Level Course

Russ, John C., North Carolina State Univ., USA; Alderman, Cheryl S., North Carolina Univ., USA; Standard Experiments in Engineering Materials Science and Technology; Jul. 1997, pp. 513-515; In English; Also announced as 19980010742; No Copyright; Avail: CASI; A01, Hardcopy; A04, Microfiche

We will demonstrate and describe the impact of our use of multimedia and network connectivity on a sophomore-level introductory course in materials science. This class services all engineering students, resulting in large (greater than 150) class sections with no hands-on laboratory. Concerned that traditional lecture and textbook approaches did not reach many students whose learning style is primarily visual and interactive rather than auditory and passive, we began in 1990 to develop computer graphics that might substitute for some laboratory or real-world experiences, and demonstrate relationships hard to show with static textbook images or chalkboard drawings.

Derived from text

Multimedia; Computer Graphics; CD-ROM; Computer Networks

81

ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

19980009325 NERAC, Inc., Tolland, CT USA

Materials Planning and Inventory Control: Computer Utilization. (Latest Citations from Information Services in Mechanical Engineering Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-866470; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of computer equipment and software for materials planning and inventory management. Descriptions and evaluations of specific systems currently in operation in the manufacturing, transportation, and food industries are discussed. The references also examine system selection considerations and the use of bar codes and digital scales in inventory control and microcomputers.

NTIS

Bibliographies; Management Planning; Materials Handling; Microcomputers; Inventory Management

19980009799 National Inst. of Standards and Technology, Systems and Network Architecture Div., Gaithersburg, MD USA
Federal Implementation Guideline for Electronic Data Interchange: ASC X12 003050 Transaction Set 836 Procurement Notices. Implementation Convention

Favreau, J. P., National Inst. of Standards and Technology, USA; Feb. 1996; 43p; In English
Report No.(s): PB96-178892; NIST/SP-881/9; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This implementation convention provides the information necessary for the user to be able to develop an interface program between the computer application and the ASC X12 translator.

NTIS

Government Procurement; Contracts; Telecommunication

19980009898 NERAC, Inc., Tolland, CT USA
Executive Management Training. (Latest Citations from the ABI/Inform Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865514; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning executive management training. Training programs implementation, internal training programs versus the use of outside consultants, surveys of management training, and education are discussed. Topics include comparisons between the corporate practices and training programs in U.S. versus British companies, future trends in training, training evaluation, and executive retraining. (Contains 50-250 citations and includes a subject term index and title list.)

NTIS

Bibliographies; Management; Education

19980009939 NERAC, Inc., Tolland, CT USA
Management by Objectives. Guidelines and Case Studies: Latest Citations from the ABI/Inform Database

Feb. 1996; In English; Page count unavailable.

Report No.(s): PB96-862867; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning the use of Management By Objectives (MBO) to solve management problems. The MBO program includes goal setting, agreement and commitment, establishment of an action plan, implementation of the plan, and feedback. Citations review guidelines and results from companies instituting an MBO strategy.

NTIS

Bibliographies; Management Methods; Organizing

19980010032 University of Southern California, Los Angeles, CA USA
ONR-USC Research on Alternative Process Architecture for Procurement and Acquisition Final Report, Jul. 1996 - Nov. 1997

Scacchi, Walt, University of Southern California, USA; Nov. 20, 1997; 106p; In English

Contract(s)/Grant(s): N00014-94-I-0889

Report No.(s): AD-A332042; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In this project, researchers at the USC ATRIUM Laboratory engaged in a collaborative research project with the Office of Naval Research. This effort was a continuation of a project conducted with the Procurement Directorate at the Naval Air Warfare Center, Weapons Division, China Lake, CA. In both investigations, research effort was directed at understanding and redesigning business processes associated with military procurement and acquisition. In the latter case, effort focused on understanding and redesigning ONR's acquisition processes for managing research grants and contracts. A methodology for involving ONR personnel in eliciting, analyzing, and redesigning its acquisition processes was developed and frequently executed. USC researchers also investigated and developed prototype computer based information systems that support the remote modeling, analysis, visualiza-

tion, and execution of complex multi-person business processes. This led to the conception and demonstration of a new class of information system technologies called, process-driven intranets.

DTIC

Government Procurement; Management Methods

19980010421 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

Outsourcing Dod Logistics: Savings Achievable but Defense Science Board's Projections are Overstated

Warren, D. R., General Accounting Office, USA; Dec. 08, 1997; 30p; In English

Report No.(s): GAO/NSIAD-98-48; B-277816; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

We agree with Defense Science Board (DSB) that there are many opportunities for significant reductions in logistics infrastructure costs. However, the Board's projected savings are overly optimistic. Further, savings opportunities from consolidating and reengineering must be considered in addition to outsourcing. Even though the Board recognized that there are impediments to outsourcing, Program Analysis & Evaluation's (PA&Es) and our analyses show that because of such impediments, not all logistics activities can be outsourced. This is particularly true for the legislative barriers - principally, the legislated workload mix between the public and private sectors. Moreover, PA&E's and our analyses show estimating errors of about \$1 billion for contract administration and inventory reductions and another \$1 billion for reliability improvements. These combined adjustments will further reduce the Board's projected savings by another 30 percent. Notwithstanding the problems with DSB's estimates, Department of Defense (DOD's) effort to reduce costs and achieve savings is extremely important, and we encourage DOD to move forward as quickly as possible to develop a realistic and achievable cost-reduction program. As discussed in our high-risk infrastructure report, breaking down cultural resistance to change, overcoming service parochialism, and setting forth a clear framework for a reduced defense infrastructure are key to effectively implementing savings. To aid in achieving the most savings possible, we recommend that the Secretary of Defense require the development of a detailed implementation plan for improving the efficiency and effectiveness of DOD's logistics infrastructure, including reengineering, consolidating, outsourcing logistics activities where appropriate, and reducing excess infrastructure. We recommend that the plan establish time frames for identifying and evaluating alternative support options and implementing the most cost-effective solutions and identify required resources, including personnel and funding, for accomplishing the cost-reduction initiatives. We also recommend that DOD present the plan to Congress in much the same way it presented its force structure reductions in the Base Force Plan and the bottom-up review. This would provide Congress a basis to oversee DOD's plan and would allow the affected parties to see what is going to happen and when.

Derived from text

Congressional Reports; Defense Program; Cost Reduction

19980010527 Logistics Management Inst., McLean, VA USA

Using Sorties vs. Flying Hours to Predict Aircraft Spares Demand Final Report

Sherbrooke, Craig C., Logistics Management Inst., USA; Apr. 1997; 103p; In English

Contract(s)/Grant(s): DASW01-95-C-0019

Report No.(s): AD-A331910; LMI-AF501LN1; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In Operation Desert Shield/Desert Storm, while tactical aircraft flew much longer sorties than planned, the demand for aircraft spares was substantially less than expected. The war plans were based on the standard assumption that spares demand is proportional to flying hours. Since wartime demand is predicted from peacetime data, and the peacetime training missions are mostly short sorties, it is critical to know whether spares demand is driven by the number of sorties, by flying hours, or by some combination. The U.S. Air Force has now accepted the results of our analysis, which show that demand is much more closely related to the number of sorties than it is to the number of flying hours. We recommended that the Air Force use a slope of about 10 percent, meaning that for each additional hour of sortie length after the initial hour, demands increase 10 percent. The data comprise over 700,000 sorties for 24 major aircraft types. The analysis controlled for a number of explanatory variables, including deferred maintenance, mission type, and location, as well as sortie length.

DTIC

Aircraft Maintenance; Aircraft Equipment; Spare Parts

19980010811 Naval Postgraduate School, Monterey, CA USA

Contracting in a Foreign Country

Rodeschin, Darrin, Naval Postgraduate School, USA; Jun. 1997; 101p; In English

Report No.(s): AD-A331949; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The emergence of the USA as the only remaining superpower requires its forces to deploy to an increasing number of foreign countries. U.S. businesses are expanding their markets to include many foreign countries as well. Additionally, the United Nation's role as a multi-national peacekeeping force is growing. This thesis investigates and compares the different contracting structures of the U.S. Army, the UN, and Apple as well as the duties and responsibilities of the contracting individuals within these organizations. It also explores the regulations and policy, training and organization-specific issues relevant to overseas contracting. This thesis revealed that although each organization is unique in its methodology of overseas contracting, it is possible for each organization to learn from another's method of contracting. This thesis did not determine the best way to conduct overseas contracting, nor was this the intent. The objective was to compare different ways of contracting overseas. In doing so, a reference document is now available for current and future contractors. The knowledge gained from this document will help prepare these contractors to meet the challenge of contracting in a foreign country.

DTIC

Education; Market Research; Policies; Regulations

19980010867 General Accounting Office, General Government Div., Washington, DC USA

Managing for Results: Prospects for Effective Implementation of the Government Performance and Results Act. Statement of L. Nye Stevens, Director, Federal Management and Workforce Issues, General Government Division

Jun. 03, 1997; 22p; In English

Report No.(s): PB98-111966; GAO/T-GGD-97-113; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Government Performance and Results Act, which is referred to as 'GPRA' or 'the Results Act,' seeks to shift the focus of federal management and decisionmaking away from a preoccupation with the activities that are undertaken - such as grants for inspections made - to a focus on the results of those activities - such as real gains in employability, safety, responsiveness, or environmental quality. GAO found that agencies are confronting five key challenges that have limited the effective implementation of the Results Act. These challenges include those associated with (1) establishing clear agency missions and strategic goals, especially when program efforts are overlapping or fragmented; (2) measuring performance, particularly when the federal contribution to a result is difficult to determine; (3) generating the results-oriented performance information needed to set goals and assess progress; (4) instilling a results-oriented organizational culture within agencies; and (5) linking performance plans to the budget process.

NTIS

Congressional Reports; Management Planning; Decision Making

19980010953 General Accounting Office, General Government Div., Washington, DC USA

Paperwork Reduction: Governmentwide Goals Unlikely to Be Met (Statement of) Michael Brostek, Associate Director, Federal Management and Workforce Issues

Jun. 04, 1997; 28p; In English

Report No.(s): PB98-111958; GAO/T-GGD-97-114; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report focuses on three issues: (1) the Office of Management and Budget's (OMB) efforts to fulfill its responsibilities under the act, particularly its responsibility for establishing and overseeing governmentwide and agency-specific paperwork reduction goals; (2) the likelihood of the government and particular agencies meeting those goals; and (3) any impediments the government faces in reaching the goals. It addresses these issues by reviewing selected aspects of the act's implementation at OMB and three agencies - the Internal Revenue Service (IRS), the Environmental Protection Agency (EPA), and the Occupational Safety and Health Administration (OSHA).

NTIS

Congressional Reports; Papers; Reduction

19980010954 General Accounting Office, General Government Div., Washington, DC USA

Privatization and Competition: Comments on S.314, the Freedom from Government Competition Act. Statement of L. Nye Stevens, Director Federal Management and Workforce Issues General Government Division

Jun. 18, 1997; 18p; In English

Report No.(s): PB98-111933; GAO/T-GGD-97-134; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The Subcommittee is considering S.314, the Freedom From Government Competition Act. The bill would require that the government procure from the private sector, with some exceptions, the goods and services it needs to carry out its functions. The

Subcommittee has asked that today the authors discuss the new bill as a potential vehicle for competitive contracting, using the results of the authors' recent work on privatization initiatives at the state and local government levels.

NTIS

Government Procurement; Competition; Government/Industry Relations; Congressional Reports

19980010955 General Accounting Office, Washington, DC USA

Managing for Results: The Statutory Framework for Improving Federal Management and Effectiveness. Statement of James F. Hinchman, Acting Comptroller General

Jun. 24, 1997; 22p; In English

Report No.(s): PB98-111917; GAO/T-GGD/AIMD-97-144; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The purpose of this report is to provide an overview of this statutory framework and discuss how Congress can use the framework, in particular the Results Act, to help identify and address some of the key management challenges that are undermining the effectiveness and responsiveness of federal agencies. This also highlights the key implementation issues associated linking the benefits of this statutory reform framework with the budget process. Finally, report suggests how the framework, if fully implemented, can be used by Congress to strengthen its decisionmaking and oversight and better assure that the public get the efficient and responsive government that is being demanded.

NTIS

Cost Effectiveness; Congressional Reports; Federal Budgets; Management Planning

19980010976 Naval Postgraduate School, Monterey, CA USA

A Dictionary of Acquisition and Contracting Terms

Mullin, Drew K., Naval Postgraduate School, USA; Jun. 1997; 192p; In English

Report No.(s): AD-A331958; No Copyright; Avail: CASI; A09, Hardcopy; A02, Microfiche

This thesis effort is a continuance of research to determine, through a consensus of opinion among contracting professionals, a definition for current contracting terminology. This research was first initiated by Lieutenant Commander Daniel L. Ryan, Supply Corps, USA Navy and was later accomplished by others at both the Naval Postgraduate School, Monterey, California, and at the Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio. As with the previous efforts, this thesis examined literary sources for the current definitions and usage of the chosen terms. A definition for each of twenty five terms was synthesized, incorporated in an open ended survey, and sent to contracting professionals affiliated with the National Contract Management Association. Respondent comments were analyzed, and, when appropriate, incorporated in the final, proposed definitions.

DTIC

Dictionaries; Acquisition; Terms

19980010993 General Accounting Office, Resources Community and Economic Development Div., Washington, DC USA

Department of Energy: Subcontracting Practices

Nov. 24, 1997; 14p; In English

Report No.(s): AD-A332601; GAO/RCED-98-30R; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In certain instances federal and DOE procurement regulations place limits on subcontracting between a DOE contractor and its corporate affiliates. The nature of DOE's controls over these transactions between corporate affiliates depends on the type of contract that exists between DOE and the prime contractor. If DOE has a cost-reimbursement contract with the prime contractor under which the contractor generally is paid for all costs incurred, the regulations generally (1) require that DOE have approval authority over transactions between corporate affiliates and (2) prohibit amounts for profit that can be charged on such transactions if the contractor and subcontractor have the same corporate affiliation. However, if DOE has a fixed-price contract with the prime contractor under which the contractor is paid a fixed amount regardless of the contractor's costs for doing the work, the regulations do not call for imposing such controls on subcontracts. Controls are not applied under fixed-price contracts because, unlike under cost-reimbursement arrangements, the overall costs to the government are not affected. In the case of the Pit 9 project, even though the prime contract was a cost-reimbursement contract, DOE allowed the subcontractor to include an amount for profit DOE did so because at the time the Pit 9 subcontractor was initially selected, the management and operating contract for the Idaho Falls site was held by EG&G Idaho, a company that was not a corporate of Lockheed Martin Advanced Environmental Systems.

DTIC

Government Procurement; Energy Requirements

19980011586 Technische Univ., Eindhoven, Netherlands

Modeling Stochastic Lead Times in Multi-Echelon Systems

Diks, E. B., Technische Univ., Netherlands; vanderHeijden, M. C., Technische Univ., Netherlands; Nov. 1996; 18p; In English
Report No.(s): PB97-204432; MEMO-COSOR-96-33; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

In many multi-echelon inventory systems, the lead times are random variables. A common and reasonable assumption in most models is that replenishment orders do not cross, which implies that successive lead times are correlated. However, the process which generates such lead times is usually not well-defined, which is especially a problem for simulation modeling. In this paper, we use results from queueing theory to define a set of simple lead time processes guaranteeing that (1) orders do not cross, and (2) prespecified means and variances of all lead times in the multi-echelon system are attained.

NTIS

Random Variables; Stochastic Processes; Queueing Theory; Optimal Control; Inventory Controls; Inventory Management; Process Control (Industry)

19980011616 Naval Postgraduate School, Monterey, CA USA

Cost As an Independent Variable Implementation Issues

Henningsen, David W., Naval Postgraduate School, USA; Mar. 1997; 114p; In English
Report No.(s): AD-A331879; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

This thesis will examine challenges defense department managers face when implementing the cost as an independent variable (CAIV) concept of cost control. The CAIV concept replaces the design-to-cost (DTC) concept which only achieved limited success. Emphasis is placed on identifying issues that managers faced implementing the DTC concept. These issues are analyzed to determine the potential cause of the issue and the impact the issue may have on programs implementing CAIV. It is the contention of this thesis that the CAIV concept and the DTC concept are in theory, virtually identical. Many of the same issues will surface during CAIV implementation that managers faced implementing DTC. CAIV may become another ineffective cost control measure. However, DTC was not usually implemented as intended by the guidance. In addition, acquisition reform has provided the manager implementing the CMV concept significant advantages over previous managers. With full management support, programs implementing the CAIV concept can succeed and provide cost effective systems that meet the needs of the user.

DTIC

Cost Effectiveness; Independent Variables; Financial Management

19980011628 General Accounting Office, National Security and International Affairs Div., Washington, DC USA

National Missile Defense: Schedule and Technical Risks Represent Significant Development Challenges. Report to Congressional Requesters

Dec. 12, 1997; 20p; In English

Report No.(s): GAO/NSIAD-98-28; B-275013; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

While the Ballistic Missile Defense Organization (BMDO) had been developing and maturing technologies for use in an NMD system for a number of years, in October 1996 it began developing a specific NMD system to provide protection against limited ballistic missile attacks targeted at the United States. Its mission is to detect, identify, engage, intercept, and destroy threatening ballistic missiles prior to their impact on any of the 50 states. The program focuses on the development of a system that could support a deployment readiness review in fiscal year 2000. The review would determine whether the initial system has been adequately demonstrated and if the existing threat justifies deployment of an initial capability by fiscal year 2003. This plan is commonly referred to as the "3+3" program. Figure 1 shows the program schedule, assuming a decision in fiscal year 2000 to deploy the system.

Author

Congressional Reports; Defense Program; Missile Defense; Technologies

19980011688 Michigan Univ., Artificial Intelligence Lab., Ann Arbor, MI USA

Knowledge-Based Decision Model Construction for Dynamic Interpretation Tasks Final Report, 1 Nov. 1993 - 31 Jan. 1997

Wellman, Michael P., Michigan Univ., USA; Apr. 29, 1997; 22p; In English

Contract(s)/Grant(s): F49620-94-I-00275

Report No.(s): AD-A332426; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The aim of this project was to identify general principles and develop concrete techniques for knowledge-based construction of probabilistic models supporting dynamics decision making under uncertainty. We focused on problems where the precise decision context (i.e., which options are available and what information is known) is highly variable, precluding specification of a fixed model in advance. The project yielded technical results in four areas of reasoning and decision making under uncertainty

involving model construction: (1) path planning and scheduling under uncertainty, (2) abstraction and other approximation methods for Bayesian networks, (3) Bayesian methods for pattern and plan recognition, and (4) aggregation of beliefs across multiple agents.

DTIC

Knowledge Based Systems; Decision Support Systems; Decision Making

82

DOCUMENTATION AND INFORMATION SCIENCE

Includes information management; information storage and retrieval technology; technical writing; graphic arts; and micrography. For computer documentation see 61 Computer Programming and Software.

19980009217 NERAC, Inc., Tolland, CT USA

Relational Database Management Systems: Market Aspects. (Latest Citations from the Computer Database)

Mar. 1996; In English; Page count unavailable.

Report No.(s): PB96-865290; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

The bibliography contains citations concerning market activities and prospects for relational database management systems. Descriptions of packages offered by specific vendors are included, and micro and mainframe software packages are addressed. Some attention is given to Structured Query Language (SQL) and its use in database management systems.

NTIS

Bibliographies; Information Systems; Marketing; Computer Programs; Applications Programs (Computers)

19980009255 Interior Dept., Office of Information Resources Management, Washington, DC USA

Information Resources Management: Strategic Plan 1995-1999

1996; 92p; In English

Report No.(s): PB96-185970; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This IRM Strategic Plan (Plan) seeks to improve the quality and availability of information managed by the Department of Interior. The Department's information resources include the Department's information and the associated information technologies and methodologies, human resources, and other resources necessary to effectively manage and utilize that information.

NTIS

Information Resources Management; Information Systems; Data Management; Strategy

19980009418 California Univ., Dept. of Computer Science, Los Angeles, CA USA

Research on Cooperative Active Database System Final Report, Sep. 1995 - Sep. 1996

Chu, Wesley W., California Univ., USA; Aug. 1997; 12p; In English

Contract(s)/Grant(s): F30602-95-I-0052; AF Proj. R427

Report No.(s): AD-A330609; A95-3061A-00; RL-TR-97-90; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Active database systems are receiving increasing interests from both research and commercial communities. However, rules are often difficult to specify and the complexity increases as the database increases in its size. To remedy this problem, we propose to use relaxation techniques for rule generation and relaxation. by using high level concepts and cooperative operators in active rules, we can not only simplify the rule specification process, we can also increase the expressiveness of active rules. High level concepts and cooperative operators used in rules are first relaxed into low level active rules by using a tree type knowledge structure called Type Abstraction Hierarchy (TAH). The relaxed rules are then classified into equivalent classes by domain experts. Rule generation and relaxation are accomplished by relaxing the attributes in the rule conditions and/or by relaxing the actions with cooperative operators. This report presents a design concept of Cooperative Active Database Systems and their future research directions.

DTIC

Data Bases; Software Engineering; Software Reliability

19980009460 Nebraska Univ., Lincoln, NE USA

Applications of Geometric Invariants to Computer Vision: AASERT Grant Final Report, 1 Jul. 1994 - 30 Sep. 1997

Bhattacharya, Prabir, Nebraska Univ., USA; Aug. 12, 1997; 7p; In English

Contract(s)/Grant(s): F49620-94-I-0280

Report No.(s): AD-A332074; AFOSR-TR-97-0663; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

This is an AASERT grant that is a supplementary award to the parent AFOSR Grant FR962O-94-1-002. The objective was to train a graduate student who must be a U.S. citizen. We have achieved this objective and the student will be awarded a Ph.D. in Computer Science in August 1997. Also, the student published several papers in refereed journals and gave oral presentations in two international conferences. We developed a method for object recognition by extracting conics from digitized images and computing their invariants. The proposed method was extensively tested under noisy conditions and the results were highly satisfactory. We also investigated the geometrical properties of the Legendre transform that are of interest in image understanding applications. Finally, we developed a matching algorithm for space curves, which reduces the problem to finding the eigenvalues of a 4-dimensional matrix.

DTIC

Computer Vision; Pattern Recognition; Images

19980009547 SRI International Corp., Menlo Park, CA USA

A Generic Knowledge-Base Browser and Editor Final Report, Sep. 1994 - Jan. 1997

Lowrance, John D., SRI International Corp., USA; Paley, Suzanne M., SRI International Corp., USA; Karp, Peter D., SRI International Corp., USA; Olowe, Ife, SRI International Corp., USA; Oct. 1997; 68p; In English

Contract(s)/Grant(s): F30602-94-C-0263; AF Proj. 5581

Report No.(s): AD-A331868; RL-TR-97-114; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Generic KnowledgeBase Editor (EKG-Editor) is a generic editor and browser of KBs and ontologies - generic in the sense that it is portable across several FRSs. This generally is possible because the GKB-Editor performs all KB access and modification operations by using a generic application programming interface (API) to FRSs called the Generic Frame Protocol (GFP). To adapt the GKB-Editor to a new FRS, we need only to create a GFP implementation for that FRS - a task that is usually considerably simpler than implementing a complete KB editor. The GKB-Editor also contains several relatively advanced features, such as incremental browsing of large graphs, KB analysis tools, operation over multiple selections, cut-and-paste operations, and both user- and KR-specific profiles.

DTIC

Computer Programming; Knowledge Based Systems; Protocol (Computers)

19980009819 Wright Lab., Plans and Programs Directorate, Wright-Patterson AFB, OH USA

Index to US Army Air Corps Information Circulars, Part 1, Heavier-Than-Air Circulars No. 1-715 Final Report, 1 Jan. 19 - 1 Dec. 1939

Oct. 1997; 56p; In English

Report No.(s): AD-A330597; WL-TR-97-6007-Pt-1-2; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

Indexes by subject and circular number US Army Air Corps Information Circulars prepared at McCook Field between 1919 and 1939 and published by the Government Printing Office. This report is composed of the complete text of Circular No. 677 and two additional pages that update this circular's numeric listing by including title information about circulars 678 to 715.

DTIC

Indexes (Documentation); Bibliographies; Military Aviation

19980009940 Logicon R and D Associates, Arlington, VA USA

Electronic Imaging Standards for Archiving Records, Volume 1 Final Report

May 31, 1997; 50p; In English

Contract(s)/Grant(s): DAAB07-91-D-B519

Report No.(s): AD-A332470; DoD-97-S-2263; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Purpose: Requirements analysis for electronic records recording formats that will lead to the selection of alternative standards for the storage and retrieval of electronic records and the information they contain. Content: First report to provide information on image standards agencies with which the Department of Defense should participate in order to assure the needs of the Department are addressed by emerging standards. Selection criteria used in narrowing the standards considered are included. Recommendation made to the National Archives of SGML as a format in which to preserve image of historical value. Limitations of SGML. Further study required.

DTIC

Imaging Techniques; Information Retrieval; Document Storage

19980010176 Capraro Technologies, Inc., Utica, NY USA

Data Management for an Integrated Computational Environment *Final Report, Mar. 1995 - Sep. 1996*

Capraro, Gerard T., Capraro Technologies, Inc., USA; Aug. 1997; 94p; In English

Contract(s)/Grant(s): F30602-95-C-0109; AF Proj. 2338

Report No.(s): AD-A329965; RL-TR-97-70; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

In this report we are concerned with establishing a framework for an intelligent information processing paradigm for USAF weapon system development and maintenance. This involves the intelligent processing of data, knowledge, and information. Our goal is to design and develop a data management structure which will automate portions of this process. This approach will be prototyped and demonstrated using an actual system as related to reliability and electromagnetic sciences. The need for this work is evidenced by many factors. Technology is changing at an accelerated rate. The technology 'know how' and expertise of many people are disappearing within corporations because of downsizing, acquisitions, and early retirements. Managing of information is important throughout the USAF. We must capture and harness information and obtain knowledge on a daily basis. If we lose information through the loss of people or poor documentation then we may be the victims of recreating the past with additional expense. We must capture the data, knowledge, and information and process it in an intelligent manner. The USAF is changing how it acquires, builds and maintains its weapon systems. It is not immune to information, inaccurate data, and 'cloudy' knowledge. This report and the work that flows from it will result in a better and more efficient way to survive in this information driven world.

DTIC

Systems Engineering; Weapon Systems; Data Management; Data Processing

19980010420 Army IMA Integration and Analysis Center, Washington, DC, USA

Information Mission Area Primer: Version 2.5

1996; 102p; In English

Report No.(s): PB96-186697; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

The Army Enterprise Strategy is the single unified vision for the Army's Command, Control, Communications, Computers and Intelligence (C4I) community. It integrates current Army doctrine and modernization plans for developing and fielding information systems.

NTIS

Information Systems; Strategy; Intelligence; Command and Control; Telecommunication

19980010465 RMS Associates, Linthicum Heights, MD USA

Computer Supported Indexing: A History and Evaluation of NASA's MAI System, Supplement 24

Silvester, June P., RMS Associates, USA; Encyclopedia of Library and Information Science; 1997; Volume 61, pp. 76-90; In English

Contract(s)/Grant(s): NASw-4584

Report No.(s): NASA/CR-97-206517; NAS 1.26:206517; ISBN 0-8247-2061-X; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Computer supported indexing systems may be categorized in several ways. One classification scheme refers to them as statistical, syntactic, semantic or knowledge-based. While a system may emphasize one of these aspects, most systems actually combine two or more of these mechanisms to maximize system efficiency. Statistical systems can be based on counts of words or word stems, statistical association, and correlation techniques that assign weights to word locations or provide lexical disambiguation, calculations regarding the likelihood of word co-occurrences, clustering of word stems and transformations, or any other computational method used to identify pertinent terms. If words are counted, the ones of median frequency become candidate index terms. Syntactical systems stress grammar and identify parts of speech. Concepts found in designated grammatical combinations, such as noun phrases, generate the suggested terms. Semantic systems are concerned with the context sensitivity of words in text. The primary goal of this type of indexing is to identify without regard to syntax the subject matter and the context-bearing words in the text being indexed. Knowledge-based systems provide a conceptual network that goes past thesaurus or equivalent relationships to knowing (e.g., in the National Library of Medicine (NLM) system) that because the tibia is part of the leg, a document relating to injuries to the tibia should be indexed to LEG INJURIES, not the broader MeSH term INJURIES, or knowing that the term FEMALE should automatically be added when the term PREGNANCY is assigned, and also that the indexer should be prompted to add either HUMAN or ANIMAL. Another way of categorizing indexing systems is to identify them as producing either assigned- or derived-term indexes.

Derived from text

Indexes (Documentation); Expert Systems; Computers; Statistical Correlation

19980010528 Air Command and Staff Coll., Maxwell AFB, AL USA

Brilliant Warrior: Information Technology Integration in Education and Training Topical Report

Sikes, Carol S., Air Command and Staff Coll., USA; Cherry, Adelaide K., Air Command and Staff Coll., USA; Durall, William E., Air Command and Staff Coll., USA; Hargrove, Michael R., Air Command and Staff Coll., USA; Tingman, Kenneth R., Air Command and Staff Coll., USA; Aug. 1996; 75p; In English

Report No.(s): AD-A331908; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Air and Space Force (ASF) of 2025 will be a smaller and far more technical force than even today's Air Force. It will be a matured third wave information age force, incorporating new technologies, new operational concepts, new tactics, and new organizational structures. The advanced weapons of 2025 will require brilliant soldiers, sailors, marines, and airmen. The military of the future will need warriors who are not only comfortable with high-technology equipment but can also deal with diverse people and cultures, tolerate ambiguity, take initiative, ask questions, and even question authority. As a result, the ASF of 2025 will increase its emphasis on education and training to give its warriors the best possible learning opportunities in an effort to make them as productive as possible quickly and economically. To achieve these goals, the ASF will develop an integrated adaptive learning environment (ALE) centered on four overlapping areas which impact education and training. These areas include the people involved in the learning process along with their changing roles and responsibilities; the evolving goals and objectives of education and training programs; the new skills, knowledge, and competencies required in the information age; and rapidly emerging information systems technologies such as high-capacity global networks, digital knowledge-bases, advanced software, and virtual reality systems.

DTIC

Information Systems; Defense Program; Training Devices

19980010598 GMD-German National Research Center for Computer Science, Washington, DC USA

Innovation Through Research

Sep. 1996; 45p; In German; In English; No Copyright; Avail: Issuing Activity (German National Research Center for Information Technology, Dept. for Information and Corporate Comm., D-53754 Sankt Augustin), Hardcopy, Microfiche

GMD is the national research center for information technology. It is a member of the Hermann von Helmholtz Association of German Research Centers (HGF). GMD conducts research in the following key areas of information technology: (1) system design technology; (2) communication and cooperation systems; (3) intelligent multimedia systems; and (5) parallel computing. GMD's research and development activities are application-oriented, and the relevant projects closely cooperate with partners from industry and science. GMD was established on 25 April 1968. Its legal status is that of a non-profit limited liability private company (GmbH). The shareholders are the Federal Republic of Germany (90%), represented by the Federal Ministry of Education, Science, Research and Technology (BMBF), and the Federal States of Hesse and North-Rhine-Westphalia (5% each). GMD has a staff of 1250 including 250 students, doctoral candidates and apprentices. The annual total budget of GMD is approximately DM 170 million, almost 30 % of this amount comes from project work and industrial cooperation.

Derived from text

Research Facilities; Research and Development; Telecommunication; Systems Engineering; Parallel Processing (Computers)

19980010863 NASA Scientific and Technical Information Facility, Baltimore-Washington International Airport, MD USA

NASA Thesaurus, Volume 2, Rotated Term Display

Jan. 1998; 374p; In English

Report No.(s): NASA/SP-98-7501/Vol-2; NAS 1.21:7501/Vol-2; No Copyright; Avail: CASI; A16, Hardcopy; A03, Microfiche

The NASA Thesaurus contains the authorized subject terms by which the documents in the NASA STI Databases are indexed and retrieved. The scope of this controlled vocabulary includes, not only aerospace engineering, but all supporting areas of engineering and physics, the natural space sciences (astronomy, astrophysics, planetary science), Earth sciences, and to some extent, the biological sciences. It contains over 17,700 subject terms and approximately 4,000 USE references. Volume 2 - Rotated Term Display, is made available as a ready-reference tool to provide better access to the terms in the Hierarchical Listing With Definitions (Volume 1). The Rotated Term Display is essentially a key-word-in-context (KWIC) index that provides access to every word in postable terms and nonpostable USE references. It provides over 21,000 additional 'access points' to the thesaurus terminology.

Author

KWIC Indexes; Terminology; Thesauri; Information Retrieval; Hierarchies

19980010881 Technische Univ., Twente, Netherlands

WIDE Workflow Model and Architecture

Casati, F., Politecnico di Milano, Italy; Grefen, P., Technische Univ., Netherlands; Pernici, B., Politecnico di Milano, Italy; Pozzi,

G., Politecnico di Milano, Italy; Sanchez, G., Societe d'Economie et de Mathematique Appliquees, Spain; 1997; 53p; In English Report No.(s): PB97-204481; CTIT-TR-96-19; Copyright Waived; Avail: CASI; A04, Hardcopy; A01, Microfiche

Workflow management systems need to be more integrated with data management technology, in particular as it concerns the access to external databases and as a support technology for workflow management, to support intelligent exception handling and transaction management. In the WIDE (Workflow on Intelligent and Distributed database Environment) project, a conceptual model is proposed, including an organizational model as a basis for task assignment proposed for the project, advanced functionalities for exception handling, the concepts of multitask and supertasks for workflow modularization, and integrated extended transactional semantics.

NTIS

Management Systems; Support Systems; Data Management; Data Bases

19980010905 Naval Postgraduate School, Monterey, CA USA

Analysis of an Imperfect Information Flow Reduction and Sorting System

Sears, John A., III, Naval Postgraduate School, USA; Mar. 1997; 94p; In English

Report No.(s): AD-A331698; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

This thesis studies the employment of an information flow reduction and sorting system. The system is designed to reduce the amount of information gathered by a collection system to a rate that a user of that information can accept. The thesis demonstrates the benefits of trait based analysis of information as a method of screening desired information from undesired. These systems increase the quality of the information reaching the user while adding a delay to achieve the screening process. A method of networking the screening devices is discussed. A sorting system is added to the screening process to demonstrate its ability to increase the speed of desired information through the system. The models are illustrated through numerical examples. The analysis provides the user of these systems with an understanding of their design, employment, benefits, costs and calibration requirements.

DTIC

Information Flow; Data Reduction; Data Management; Collection; Classifying

19980010926 NASA Scientific and Technical Information Facility, Baltimore-Washington International Airport, MD USA

NASA Thesaurus, Volume1, Hierarchical Listing with Definitions

Jan. 1998; 1200p; In English

Report No.(s): NASA/SP-98-7501/Vol-1; NAS 1.21:7501/Vol-1; No Copyright; Avail: CASI; A99, Hardcopy; A10, Microfiche

The NASA Thesaurus contains the authorized subject terms by which the documents in the NASA STI Databases are indexed and retrieved. The scope of this controlled vocabulary includes not only aerospace engineering, but all supporting areas of engineering and physics, the natural space sciences (astronomy, astrophysics, planetary science), Earth sciences, and to some extent, the biological sciences. Volume 1 - Hierarchical Listing With Definitions contains over 17,700 subject terms, 3,832 definitions, and more than 4,000 USE cross references. The Hierarchical Listing presents full hierarchical structure for each term along with 'related term' lists, and can serve as an orthographic authority. Volume 2 - Rotated Term Display is a ready-reference tool which provides over 21,000 additional 'access points' to the thesaurus terminology. It contains the postable and nonpostable terms found in the Hierarchical Listing arranged in a KWIC (key-word-in-context) index.

Author

Hierarchies; Terminology; Thesauri; Information Retrieval; KWIC Indexes

19980010930 Naval Postgraduate School, Monterey, CA USA

Intranet Technology: Considerations for Implementation within the Department of Defense

Rich, Oliver E., Jr., Naval Postgraduate School, USA; Rich, Valerie S., Naval Postgraduate School, USA; Mar. 1997; 120p; In English

Report No.(s): AD-A331697; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

Intranets, internal networks based on the same technology and protocol as the World Wide Web, have emerged in the past two years as a very popular medium for communication and information exchange within organizations. Organizations are flocking to this new tool in order to maintain or improve their market share and enhance communications and productivity. The purpose of this thesis is to give the DoD some guidance in deciding if this new wave of technology is suitable for its computing and information environment. A qualitative approach is used in obtaining the data for this thesis. The primary assumption of this research is that the introduction of an intranet is similar to the introduction of any information system. Therefore, a sample of information technology professionals with at least five years experience in planning, developing, managing, and implementing information systems within DoD or large, bureaucratic, and hierarchical organizations is interviewed. The interviews reveal a process of implementation that is heavily dependent on variables such as culture, structure, and size of the organization. The process has four major

phases: leadership buy-in, prototype introduction, attainment of critical mass, and intranet refinement. The authors conclude that intranet technology creates the Opportunity for the DoD to become more productive and more efficient. They note that the real test for DoD implementors is in the application of the technology.

DTIC

Networks; Information Systems; Protocol (Computers); Defense Program; World Wide Web

19980010941 Patent and Trademark Office, Washington, DC USA

Appendix to the FY98 Corporate Plan: PTO Strategic Information Technology Plan for Fiscal Years 1997-2002. Executive Overview

May 1997; 201p; In English

Report No.(s): PB97-180251; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

Whether employees are examining a patent or trademark application, assessing fees, answering customer questions, or providing assistance in the public search facilities, the quality, accuracy, and efficiency of their effort often depends on their ability to access information in a timely manner and in a useful format. With this in mind, the PTO is focusing on a strategic direction to develop an information technology environment for itself, its international partners, and the public, where patent and trademark information is created once, managed effectively, used often, and evolved over time to electronic commerce whereby most internal and external transactions are performed electronically and are accessible through the Global Information Infrastructure.

NTIS

Commerce; Information Systems; Management Systems; Organizations

19980011661 Naval Postgraduate School, Monterey, CA USA

Techniques for Multiple Database Integration

Whitaker, Barron D., Naval Postgraduate School, USA; Mar. 1997; 77p; In English

Report No.(s): AD-A331862; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

There are several graphic client/server application development tools which can be used to easily develop powerful relational database applications. However, they do not provide a direct means of performing queries which require relational joins across multiple database boundaries. This thesis studies ways to access multiple databases. Specifically, it examines how a 'cross-database join' can be performed. A case study of techniques used to perform joins between academic department financial management system and course management system databases was done using PowerBuilder 5.0. Although we were able to perform joins across database boundaries, we found that PowerBuilder is not conducive to cross-database join access because no relational database engine is available to execute cross-database queries.

DTIC

Systems Integration; Data Bases; Data Management

19980011874 National Library of Medicine, MEDLARS Management Section, Bethesda, MD USA

Basics of Searching MEDLINE on ELHILL

Jul. 1997; 222p; In English

Report No.(s): PB97-199681; No Copyright; Avail: CASI; A10, Hardcopy; A03, Microfiche

The Basics is designed to be used in a formal training course or to serve as a self-paced tool. It provides an introduction to the key techniques used in searching MEDLINE. Other more effective and efficient searching techniques can be acquired through experience and from additional training as well as a careful study of reference guides such as the Online Services Reference Manual and other publications as listed in the Appendix. All examples in the Basics were generated from MEDLINE. It is important to keep in mind that the number of citations retrieved in the search exercises may vary with the current size of the database. They will, however, be representative of the size and scope of MEDLINE.

NTIS

Clinical Medicine; Information Retrieval; Manuals; On-Line Systems

19980011878 Assistant Secretary of Defense (Public Affairs), Washington, DC USA

American Forces Information Service Report on Information Technology (IT) Resources: FY 1997 Budget Estimates

1996; 12p; In English

Report No.(s): PB96-178264; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Contents include the following: Exhibit 43ES: Executive Summary; Exhibit 43: Report on Information Technology Resources; Exhibit 43(IT-1): Information Technology Resources by CIM Functional Area; Exhibit 43(IT-3): FIP Resource Requirements and Indefinite Delivery/Indefinite Quantity Contract(s).

NTIS

Budgets; Defense Program; Information Systems

83

ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

19980009268 National Science Foundation of US, Tokyo, Japan

Quick Summary of JFY 1997 Government Budget Proposed for Science and Technology

Jan. 7, 1997; 6p; In English

Report No.(s): PB97-134316; MEMO-97-01; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

On December 27, 1996, Japan's Science and Technology Agency (STA) made public a 'quick summary' of the level of government funding for science and technology in JFY 1997 as included in the government budget proposal approved by the Cabinet on December 25, 1996. The 'quick summary' is based on budget estimation figures submitted to STA from the various ministries and agencies concerned. The government budget proposal for JFY 1997 (April 1, 1997 - March 31, 1998) will be presented to the National Diet soon after Diet convenes for its 140th Ordinary Session later this month.

NTIS

Research and Development; Budgets; Estimates; Technologies

19980010261 Nebraska Univ., Aviation Inst., Omaha, NE USA

NASA and Ethics: Training and Practice

Bruce, Willa Marie, Editor, Nebraska Univ., USA; Russell, Valerie, Editor, Nebraska Univ., USA; Journal of Air Transportation World Wide; Nov. 1997; Volume 2, No. 1, pp. 22-37; In English; Also announced as 19980010259; No Copyright; Avail: CASI; A03, Hardcopy; A02, Microfiche

This paper is about the National Aeronautics and Space Administration(NASA) and the practice of professional ethics. It has been eleven years(Jan. 28, 1986) since the Challenger accident and the past decade has been a time of investigation, assessment, and finger-pointing, as well as a time for introspection and internal reform. While there has been a lot of rhetoric about ethical commitments at NASA, there has also been a dearth of empirically-based knowledge about what NASA and its various contractors are doing about professional ethics and what decisionmaking criteria are being used. It has been a decade of cost-cutting and personnel cut-backs. One has to wonder what, in all this time, NASA has done to create an ethical climate in which events like the Challenger accident are less likely to happen. In the fall of 1995, as part of competition for a mini-grant from NASA, a request for funding to complete an ethical profile of the agency was submitted. This paper contributes to knowledge about NASA and ethics by reporting on the results of the first year of research which was spent in doing a comprehensive literature and web-site review along with phone interviews and e-mail correspondence with NASA ethics officers. The goal of this first year was to see what ethics activity has been documented and to ascertain what work is being done to raise the ethical question with NASA. Questions for which answers were sought include: (1) What is NASA now doing regarding ethics?; (2) What training is being provided? by whom? For whom?; (3) Are the answers to these questions different at different NASA installations?

Author

NASA Programs; Education; Decision Making; Challenger (Orbiter); Accidents; Ethics

19980011677 Institute for Human Factors TNO, Soesterberg, Netherlands

Crosstraining and Team Performance Further Investigation Interim Report (Crosstraining en teamprestatie: een nadere verkenning)

Schaafstal, A. M., Institute for Human Factors TNO, Netherlands; Bots, M. J., Institute for Human Factors TNO, Netherlands; Sep. 26, 1997; 46p; In Dutch

Report No.(s): AD-A332937; TNO-TM-97-B020; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

An experiment is described in which the effects of three different methods for crosstraining on team performance and communication within teams are examined. The methods for crosstraining differ in information contents about the tasks, activities and informational needs of the other team members. They were developed with the aim of answering the following questions: (a) Will practice in the tasks of other team members lead to better communication strategies and to an enhanced team performance? (b)

Will an explicit training of the shared aspects of the task among different team members result in better performance than cross-training in which the various team members are trained in each others' total task. Apart from this, the effect of time pressure on the various cross training methods was examined. Finally, recommendations of Schaafstal en Bots (1997) with respect to the design of the experiment are implemented in the current experiment.

DTIC

Education; Experiment Design; Human Performance

84

LAW, POLITICAL SCIENCE AND SPACE POLICY

Includes NASA appropriation hearings; aviation law; space law and policy; international law; international cooperation; and patent policy.

19980009267 National Science Foundation of US, Tokyo, Japan

Activities Supported by National Science Foundation's Division of International Programs for Collaboration between the U.S. and Japan. Annual Report, FY96 (October 1995-September 1996)

Jan. 7, 1997; 33p; In English

Report No.(s): PB97-134324; MEMO-97-02; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This report provides information about NSF-funded researchers who arrived in Japan during FY96 (October 1995 - September 1996) under bilateral programs sponsored in part by the National Science Foundation's Division of International Programs. This list of U.S. researchers is no all inclusive as it does not include those projects and seminars that were not subject to bilateral approval. Brief descriptions of U.S.-Japan programs sponsored by NSF/INT are provided in this report.

NTIS

Japan; Research Projects; International Cooperation; USA

85

URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation. For related information see also 03 Air Transportation and Safety, 16 Space Transportation, and 44 Energy Production and Conversion.

19980009283 National Inst. of Standards and Technology, Gaithersburg, MD USA

Acceleration of Technology Development by the Advanced Technology Program: The Experience of 28 Projects Funded in 1991

Laidlaw, F. J., National Inst. of Standards and Technology, USA; 1997; 68p; In English

Report No.(s): PB97-210777; NISTIR-6047; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

This survey, conducted via structured telephone interviews of the primary investigators of the 28 projects funded by the ATP in 1991, resulted in these detailed findings: Most of the interviewees estimated that participating in ATP had helped them to reduce their technology-development cycle time anywhere from 30% to 66% with half estimating a 50% reduction (most typically from a projected six-year cycle down to a three-year cycle). A little over half of the interviewees provided quantitative estimates of the economic value of reducing cycle time by a single year -- the estimates ranged from \$1 million to several billion, with a median average value of \$5.5 million. They expected the positive impact on cycle time already experienced in the applied-research stage to flow through to later stages in the technology-development cycle (the product development, production and marketing stages), thereby causing them to enter the marketplace more quickly. These cycle-time improvements carried over to other technology development projects outside of ATP.

NTIS

Adenosine Triphosphate; Estimating; Product Development; Surveys; Median (Statistics); Economics

19980009522 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Relationships between CRDA Elements and Benefits to the Government in Technology Transfer

Davis, Mark J., Air Force Inst. of Tech., USA; Sep. 1997; 169p; In English

Report No.(s): AD-A329840; AFIT/GSM/LAS/97S-1; No Copyright; Avail: Issuing Activity (Defense Technical Information Center (DTIC)), Microfiche

Technology transfer has become an increasingly important mission of federal laboratories over the past decade, with results that benefit the government, private companies, and the nation's economy. Cooperative Research and Development Agreements (CRDAs) are the most used mechanism to perform technology transfer from our nation's federal laboratories to the private sector. The main objective of this research is to determine important CRDA elements that are associated with higher benefits to the government. Recommendations are provided for technology transfer managers to improve CRDAs by identifying the CRDA elements that are associated with higher or lower benefits to the government. Key findings include that CRDAs, in general, provide many types of important benefits to the government. Some of the CRDA elements that are associated with significantly higher government benefits include quantified manpower requirements, the commercial partner's ability to commercialize CRDA technology, market information for the CRDA technology, quantified copyright royalty rates, and quantified sales royalty rates. CRDA elements associated with significantly lower government benefits include detailed facilities requirements and the CRDA technologies stage of development.

DTIC

Management Planning; Technology Transfer; Cost Analysis; Feasibility Analysis

19980010331 Air Force Inst. of Tech., Wright-Patterson AFB, OH USA

Tracking Overhead ORTA Costs in Technology Transfer Activities

vanEgeren, Thomas S., Air Force Inst. of Tech., USA; Sep. 1997; 140p; In English

Report No.(s): AD-A329941; AFIT-GCA/LAS/97S-9; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

An ever shrinking Research and Development (R&D) budget, coupled with a widespread perception that the nation is not realizing an adequate return from its substantial investment in the federal laboratory system, has paved the way for an increase in the transfer of technology from the federal laboratories to the private sector. The objective of this research is to determine the indirect cost of performing technology transfer by identifying the resources consumed by several key Office of Research and Technology Applications (ORTA) organizations and the activities performed within these organizations. It was hypothesized that the ORTA organizations, which are considered indirect labor by most costing methods, would expend considerable portions of their resources on activities identified as not being performed by direct labor. This hypothesis was proven true, as all but two of the identified steps consumed a significant portion of the ORTA resources.

DTIC

Technology Transfer; Cost Estimates; Research and Development; Federal Budgets

19980010978 Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA

FY 1996 Technology Transitions/Transfers

Jul. 1997; 49p; In English

Report No.(s): AD-A331963; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

This document lists 451 transitions from basic research to applications in the US Air Force, in US industry, and in other defense or nondefense government organizations. Only transitions reported during FY96 are listed; transitions reported in prior years are not repeated in this report. All reported transitions are the result of basic research funded by AFOSR; this research in many cases is still ongoing. In most cases, the research was initiated years ago, and in a few cases decades ago. This document reports current transitions as contrasted to the customary historical reporting as to how research laid the foundations for current technology and products. We used the following to define "current transitions:" A technology transition or transfer is a partnership between basic researchers and users where both expend nontrivial and sufficient resources toward realizing a product, process, or analytical objective.

DTIC

Technology Transfer; Defense Program

19980011580 Texas A&M Univ., ITS Research Center of Excellence, College Station, TX USA

Effect of Telecommunications Deregulation on the Deployment of Intelligent Transportation Systems in Texas and at the Texas-Mexico Border Final Report, Feb. 1996 - Feb. 1997

Pincus, Marcia L., Texas A&M Univ., USA; Jun. 1997; 117p; In English; Sponsored in part by the Metropolitan Transit Authority of Harris County, Houston, TX.

Contract(s)/Grant(s): DTFH61-93-X-00017-004

Report No.(s): PB97-179998; TTI/ITS-RCE-97/02; No Copyright; Avail: CASI; A06, Hardcopy; A02, Microfiche

In 1996, the U.S. and Mexico passed legislation to deregulate their telecommunications industries. In both countries, telecommunication deregulation dramatically changed the nature of the competitive relationships between telecommunications service and equipment providers, as well as changing the nature of the market in general. These changes will affect the development and

use of individual telecommunications technologies, and will also affect the nature of public-private partnerships for the research, development, and deployment of Intelligent Transportation Systems (ITS), particularly at the U.S.-Mexico border. Regulatory changes in the telecommunications sector will affect many of the technologies that form the foundation of ITS, and will also change the nature of the market for telecommunications services and equipment. This study explores in a non-technical fashion the major provisions of both Telecommunications ACTS and how each may affect the research and eventual deployment of ITS at the national and state level. This study also specifically addresses how deployment of ITS in the U.S.-Mexico border region may be affected by the interaction of two simultaneously changing telecommunications markets.

NTIS

Market Research; Telecommunication; Transportation Networks; Smart Structures

89 ASTRONOMY

Includes radio, gamma-ray, and infrared astronomy, and astrometry.

19980010455 Nobeyama Solar Radio Observatory, Nobeyama, Japan

Observations of C-13 Isotopomers of HC3N and HC5N in TMC-1: Evidence for Isotopic Fractionation

Takano, Shuro, Cologne Univ., Germany; Masuda, Akimasa, University of Electro-Communications, Japan; Hirahara, Yasuhiro, Nagoya Univ., Japan; Suzuki, Hiroko, Nobeyama Solar Radio Observatory, Japan; Ohishi, Masatoshi, Nobeyama Solar Radio Observatory, Japan; Ishikawa, Shin-ichi, Nobeyama Solar Radio Observatory, Japan; Kaifu, Norio, National Astronomical Observatory, Japan; Kasai, Yasuko, Institute of Physical and Chemical Research, Japan; Kawaguchi, Kentarou, Nobeyama Solar Radio Observatory, Japan; Wilson, T. L., Max-Planck-Inst. fuer Radioastronomie, Germany; Aug. 01, 1997; ISSN 0911-5501; 42p; In English

Report No.(s): NRO-Rept.-442; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The carbon chain molecules are well known due to their large abundances in cold dark clouds (e.g. Benson & Myers; Suzuki et al.) and in some carbon-rich circumstellar envelopes (e.g. Jewell & Snyder; Sopka et al.; Fukasaku et al.). About 40 % of interstellar molecules are classified as carbon chain molecules. The study of these molecules is, therefore, important to understand chemical processes in space. Several formation mechanisms for the carbon chain molecules have been proposed. For example, Schiff & Bohme and Mitchell et al. proposed to explain the carbon chain growth by C2 units: C2H2(+) or C2H2. On the other hand, Suzuki proposed that C(+), which was produced by interstellar ultraviolet radiation, plays an important role for the carbon chain formation. Given these possibilities, we have been obtaining observational information on the mechanism of carbon chain formation. One observational approach is to study C-13 isotopic fractionation in the carbon chain molecules. If C-13 isotopic fractionation is found, we can discuss the mechanisms of fractionation and the origin of the fractionated carbon. Such discussions are quite useful to study formation mechanisms.

Derived from text

Carbon 13; Ultraviolet Radiation; Interstellar Radiation; Chemical Reactions; Fractionation; Acetylene; Isotopes; Carbon

19980010892 Arizona Univ., Lunar and Planetary Lab., Tucson, AZ USA

Students in Advanced Research for Sky Surveillance Final Report, 1 Sep. 1993 - 31 Oct. 1997

Gehrels, Tom, Arizona Univ., USA; Nov. 09, 1997; 5p; In English

Contract(s)/Grant(s): F49620-93-I-0499

Report No.(s): AD-A332157; Rept-SW; AFOSR-97-0626TR; No Copyright; Avail: CASI; A01, Hardcopy; A01, Microfiche

Spacewatch program discovers small bodies (asteroids and comets) in the solar system and analyzes their distributions with orbital parameters and absolute magnitude. Scanning of the night sky is conducted 18-20 nights per month with the 0.9-m Spacewatch Telescope on Kitt Peak. About 1200. to 2000 square degrees of sky are searched each year to a V magnitude level of 21.3. Spacewatch discoveries support studies of the evolution of the Centaur, Trojan, Main-Belt, and Earth-approaching asteroid populations. Space watch also finds potential targets for space missions, finds objects that might present a hazard of impact on the Earth, provides accurate astrometry of about 30,000 asteroids annually, and recovers comets and asteroids that are too faint for most other observers. This AASERT grant supported several undergraduate students working on upgrades to instrumentation and analyses of data under the supervision of spacewatch engineers and researchers. The opportunity to have young, energetic new members

of the group accomplished a great deal of work, simulated and accelerated our research efforts, and enhanced the students' career opportunities.

DTIC

Centaur Launch Vehicle; Night Sky; Occupation; Personnel Management; Populations; Solar System; Space Missions; Stellar Magnitude

19980010987 Oxford Univ., Dept. of Astrophysics, Oxford, UK

Absorption Dips in the Light Curves of GRO J1655-40 and 4U 1630-47 During Outburst

Kuulkers, Erik, Oxford Univ., UK; Wijnands, Rudy, Amsterdam Univ., Netherlands; Belloni, Tomaso, Amsterdam Univ., Netherlands; Mendez, Mariano, Amsterdam Univ., Netherlands; Vandecklis, Michiel, Amsterdam Univ., Netherlands; Vanparadijs, Jan, Amsterdam Univ., Netherlands; 1997; 12p; In English

Contract(s)/Grant(s): PGS-78-277; NAG5-3269

Report No.(s): NASA/CR-97-206696; NAS 1.26:206696; OUASt/97/21; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Using the RXTE PCA we discovered deep dips in the X-ray light curves of the black-hole candidates GRO J1655-40 and 4U 1630-47 during outburst. Similar kind of dips for GRO J1655-40 were found in 90s measurements of the RXTE ASM during the same outburst. The duration of the dips in both sources is in the order of minutes. The occurrences of the dips observed with the RXTE PCA and ASM in GRO J1655-40 are consistent with the optically determined orbital period, and were found between photometric orbital phases 0.72 and 0.86. This constitutes the first evidence for orbital variations in X-rays for GRO J1655-40. The PCA data indicate that an absorbing medium is responsible for these dips. The X-ray spectra during the dips can be best described by a heavily absorbed component and an unabsorbed component. In the case of GRO J1655-40 we are able to constrain the extent of the absorbing medium and the central X-ray source.

Author

Light Curve; Accretion Disks; Black Holes (Astronomy); X Ray Spectra; X Ray Astronomy

90

ASTROPHYSICS

Includes cosmology; celestial mechanics; space plasmas; and interstellar and interplanetary gases and dust. For related information see also 75 Plasma Physics.

19980009515 Rutherford Appleton Lab., Chilton, UK

Possible Test for the Suggestion That Air Showers with E (greater than) 10(exp 20) eV Are Due to Strongly Interacting Neutrinos

Bordes, J., Valencia Univ., Spain; Hong-Mo, C., Rutherford Appleton Lab., UK; Faridani, J., Rutherford Appleton Lab., UK; Pfadler, J., Oxford Univ., UK; Sheung Tsun, T., Oxford Univ., UK; Aug. 1997; 16p; In English

Report No.(s): PB97-210439; RAL-TR-97-035; Copyright Waived; Avail: CASI; A03, Hardcopy; A01, Microfiche

The suggestion is made that air showers with energies beyond the Greisen-Zatsepin-Kuz'min spectral cut-off may have primary vertices some 6 km lower in height than those of proton initiated showers with energies below the GZK cut-off. This estimate is based on the assumption that post-GZK showers are due to neutrinos having acquired strong interactions from generation-changing dual gluon exchange as recently proposed.

NTIS

Neutrinos; Protons; Gluons; Cosmic Ray Showers

19980009650 Oxford Univ., Astrophysics, Oxford, UK

The Mass of the Neutron Star in CYG X-2 (V1341 CYG)

Casares, Jorge, Consejo Superior de Investigaciones Cientificas, Spain; Charles, Philip, Oxford Univ., UK; Kuulkers, Erik, Oxford Univ., UK; 1997; 18p; In English

Contract(s)/Grant(s): ERBFMBI-CT961756

Report No.(s): OUASt/97/24; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

Cygnus X-2 is one of the brightest and longest known X-ray sources. We present high resolution optical spectroscopy of Cyg X-2 obtained over 4 years which gives an improved mass function of 0.69 ± 0.03 solar mass (1sigma). In addition, we resolve the rotationally broadened absorption features of the secondary star for the first time, deriving a rotation speed of $v \sin i = 34.2 \pm 2.5$ km/s (1sigma) which leads to a mass ratio of $q = M(\text{sub c})/M(\text{sub x}) = 0.34 \pm 0.04$ (1sigma, assuming a tidally-locked

and Roche lobe-filling secondary). Hence with the lack of X-ray eclipses (i.e. i less than or approximately equals 73 deg) we can set firm 95% confidence lower limits to the neutron star mass of $M(\text{sub } x)$ greater than 1.27 solar mass and to the companion star mass of $M(\text{sub } c)$ greater than 0.39 solar mass. However, by additionally requiring that the companion must exceed 0.75 solar mass (as required theoretically to produce a steady low-mass X-ray binary), then $M(\text{sub } x)$ greater than 1.88 solar mass and i less than 61 deg (95% confidence lower and upper limit, respectively), thereby making Cyg X-2 the highest mass neutron star measured to date. If confirmed this would set significant constraints on the equation of state of nuclear matter.

Author

Accretion Disks; Binary Stars; X Ray Sources; Neutron Stars; Stellar Mass; Cygnus Constellation; Eclipses; Spectroscopy

19980009732 Geneva Univ., Dept. de Physique Theorique, Geneva, Switzerland

The Nexus between Cosmology and Elementary Particle Physics: Testing Theoretical Speculations through Observations of the Cosmic Microwave Background Anisotropies

Sakellariadou, Mairi, Geneva Univ., Switzerland; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 49-55; In English; Also announced as 19980009725; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The origin of the large scale structure in the universe - galaxies, quasars, clusters, voids, sheets - is one of the most important questions in cosmology. One can show that some non-thermal energy density fluctuations must have been present in the early universe. These fluctuations grew by gravitational instability to form the observed structures. There are at present two families of models to explain the origin of these initial fluctuations: inflationary models and topological defect scenarios. Current observational developments provide a link with theoretical predictions, allowing us to test our theoretical models. In this contribution, I present a sketch of the current status of the origin of cosmological structure formation.

Author

Mathematical Models; Cosmology; Elementary Particles

19980011611 Hughes STX, Inc., Lanham, MD USA

A Study of the Stellar Population in Selected SO Galaxies Final Report, Jan. 1996 - Dec. 1996

Perez, M., Computer Sciences Corp., USA; Danks, A., Hughes STX, Inc., USA; Mar. 1997; 10p; In English; Sponsored in part by Fonds Formation Chercheurs and Aide Recherche (FCAR)

Contract(s)/Grant(s): NASA Order S-14636-F

Report No.(s): NASA/CR-97-203886; NAS 1.26:203886; Rept-97-DFC-0110; No Copyright; Avail: CASI; A02, Hardcopy; A01, Microfiche

The goal of this program was to observe at least two SO galaxies with abnormal colors in the blue and clear optical signatures of dust and gas. The galaxies NGC 2217 and NGC 1808 were observed at least in one of the IUE cameras (1200-200 and 2000-3200 Å) during the 13th episode, using the 4 US1 shifts assigned to this program. The galaxy NGC 2217 had been found to be part of a subgroup of SO galaxies with external gas rotating in retrograde motion with respect to the stars. This galaxy is a face-on object with indications of large amount of gas, quite rare for a SO galaxy. We observed this object on three different occasions with IUE at different positions of the large aperture (spacecraft roll angle) with respect to the nuclear region. These exposures allowed us to take full advantage of the spatial resolution of IUE by mapping nuclear and bulge region of this galaxy. We found that the data point to a marginally earlier stellar population toward the central region. The UV light as a whole is dominated by a late-type stellar population of principally G and K stars. The almost face-on view of this galaxy appears optically thick to UV light. It is conceivable that in analogy to our own Galaxy, the stellar populations weakly detected in NGC 2217, are mostly halo and late-type stars in the center with an increasing contribution of dust and early stellar populations (so far undetected) as we move outward along the faint spiral arms. This result is contrary to our initial expectation, since the counterrotating gas does not appear to be enhancing star formation in this galaxy. Even more interesting were the observations of NGC 1808; galaxy which has been classified, with a handful of other objects, both as a starburst and Seyfert galaxy. Attachment: 'The White-Dwarf Companions of 56 Persei and HR 3643.'

Author

Stellar Evolution; Stellar Structure; Observation; Populations; Seyfert Galaxies

LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights. For spacecraft design or space stations see 18 Spacecraft Design, Testing and Performance.

19980009132 Boeing Defense and Space Group, Boeing Shock Physics, Seattle, WA USA

Computer Code Study of Asteroid Entry into Venusian Atmosphere: Pressure and Density Fields *Final Report*

Schmidt, Robert M., Boeing Defense and Space Group, USA; Dec. 31, 1997; 165p; In English; Original contains color illustrations

Contract(s)/Grant(s): NASw-4992

Report No.(s): NASA/CR-97-206731; NAS 1.26:206731; Memo-9-5570-RMS-003/98; No Copyright; Avail: CASI; A08, Hardcopy; A02, Microfiche

Analysis of the cratering records on the Moon, Mercury, and Mars have shown similar size-frequency distributions of craters produced during the late heavy bombardment of the inner solar system (Strom, 1988). Venus provides a valuable data base of information on the impacting population for more recent time. Because of resurfacing events, the Venusian cratering record has been estimated to be only about 500 million years old, and for the most part is in pristine condition, thereby producing an opportunity to discover the properties (size/velocity distribution) of the objects that recently impacted its surface. The Magellan IR mapping of the Venusian surface has produced an extremely high-quality set of crater topographies. The observed deficit of small craters is qualitatively explained by atmospheric effects on impactor breakup and the retardation effects of pressure on crater formation. Information about resurfacing history and impactor flux population can only be conjectured using arrant approximations for atmospheric effects on crater size scaling, such as assuming the absence of pressure effects or using other ad hoc approximations for this dependence. The recent work by Ivanov et al.(1986; 1992); Phillips et al.(1991; 1992); Schaber et al. (1992) and others support the notion that atmospheric effects may have strongly influenced the Venusian cratering record. The work reported here looks at the potential synergism of aerodynamic entry and the gas dynamic flow fields that govern during the time scale and in the vicinity of crater formation.

Author

Computer Programs; Asteroids; Venus Atmosphere; Pressure Distribution; Density (Mass/Volume); Data Bases

19980009748 NASA Goddard Space Flight Center, Greenbelt, MD USA

Rubidium Ultra-Stable Oscillators at Titan: The Huygens Doppler Wind Experiment

Bird, M. K., Bonn Univ., Germany; Allison, M., NASA Goddard Space Flight Center, USA; Asmar, S. W., Jet Propulsion Lab., California Inst. of Tech., USA; Atkinson, D. H., Idaho Univ., USA; Dutta-Roy, R., Bonn Univ., Germany; Edenhofer, P., Bochum Univ., Germany; Folkner, W. M., Jet Propulsion Lab., California Inst. of Tech., USA; Heyl, M., Bonn Univ., Germany; Iess, L., Rome Univ., Italy; Plettemeier, D., Bochum Univ., Germany; Preston, R. A., Jet Propulsion Lab., California Inst. of Tech., USA; Tyler, G. L., Stanford Univ., USA; Wohlmuth, R., Idaho Univ., USA; Proceedings of the Workshop on the Scientific Applications of Clocks in Space; Aug. 01, 1997, pp. 211-220; In English; Also announced as 19980009725

Contract(s)/Grant(s): DARA-50-OH-9207; No Copyright; Avail: CASI; A02, Hardcopy; A03, Microfiche

The Doppler Wind Experiment (DWE) is one of six investigations to be performed during the Titan atmospheric descent of the ESA Huygens Probe. The primary scientific objective is to measure the direction and strength of Titan's zonal winds with an accuracy better than 1 m/s. The Probe's wind-induced horizontal motion will be derived from the residual Doppler shift of its S-band radio link to the Cassini Orbiter, corrected for all known orbit and propagation effects, from the beginning of the mission (altitude: approx. 160 km) down to impact on the surface. The DWE Instrumentation consists of Rb-based Ultra-Stable Oscillators used to: (1) generate the transmitted signal from the Probe and (2) extract the frequency of the received signal on the Orbiter. The capabilities of these USOs under the rugged experimental conditions on Titan and some results from the DWE pre-launch test program are described.

Author

Rubidium; Oscillators; Stability; Titan; Doppler Effect

19980010423 Cornell Univ., Ithaca, NY USA

Surface Properties of the Moon, Venus and Small Bodies from Radar Observations *Final Report, 1 Mar. 1994 - 31 Aug. 1997*

Campbell, Donald B., Cornell Univ., USA; 1997; 22p; In English

Contract(s)/Grant(s): NAGw-3985

Report No.(s): NASA/CR-97-112957; NAS 1.26:112957; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche; Abstract Only; Abstract Only

Studies of the moon during the period of the grant revolved around the issues of the possible presence of ice at the lunar poles and the determination of the electrical properties of the maria regoliths. The search for ice at the poles was conducted using measurements of the radar backscatter cross sections and circular polarization ratios measured from 125 m resolution Arecibo radar imagery at 13 cm wavelength obtained by Nicholas Stacy. No clear indication of the presence of ice was found in areas thought to be in permanent shadow from solar radiation. Then Cornell graduate student Greg Black modeled the radar backscattering behavior of the icy Galilean satellites using three wavelength measurements of their radar backscattering properties obtained with the Arecibo and Goldstone radars. The radar scattering properties of Europa, Ganymede, and Callisto are unlike those of any other object observed with planetary radars. They are strongly backscattering with specific radar cross sections that can exceed unity. Polarization ratios are also high, approx. 1.5, indicative of multiple scattering, and the echos follow a diffuse scattering law at all incident angles with no indication of quasi-specular reflections. 3) Most of our effort on small bodies went into developing and investigating methods for long baseline radar synthesis imaging of near-earth asteroids and comets. At X-band, the width of the synthesized beam of the Very Long Baseline Array (VLBA) is approximately 15 m at 0.03AU, a typical close approach distance for near-earth asteroids. A small amount of work was done analyzing Venus data from Arecibo and the Magellan mission.

Derived from text

Surface Properties; Moon; Venus (Planet); Ice; Comets

19980010603 Massachusetts Inst. of Tech., Dept. of Earth, Atmospheric, and Planetary Sciences, Cambridge, MA USA

Planetary Tectonics and Volcanism Final Report, 1 Apr. 1996 - 30 Sep. 1997

Zuber, Maria T., Massachusetts Inst. of Tech., USA; 1997; 17p; In English

Contract(s)/Grant(s): NAGw-5021

Report No.(s): NASA/CR-97-206720; NAS 1.26:206720; No Copyright; Avail: CASI; A03, Hardcopy; A01, Microfiche

The study of tectonic and volcanological processes on the terrestrial planets, with particular emphasis on Venus, in order to better understand the internal structures and thermal and stress histories of these bodies is reported.

Derived from text

Terrestrial Planets; Volcanology; Venus (Planet); Tectonics; Mathematical Models

93

SPACE RADIATION

Includes cosmic radiation; and inner and outer earth's radiation belts. For biological effects of radiation see 52 Aerospace Medicine. For theory see 73 Nuclear and High-Energy Physics.

19980009629 Roanoke Coll., Physics Dept., Salem, VA USA

Modeling of Cosmic-Ray Transport Processes Final Report

Barghouty, A. F., Roanoke Coll., USA; Oct. 1997; 94p; In English

Contract(s)/Grant(s): N00014-95-I-G037

Report No.(s): AD-A332347; No Copyright; Avail: CASI; A05, Hardcopy; A01, Microfiche

The main task has been the development, testing, and data comparison of a global time dependent and three dimensional heliospheric transport code of galactic cosmic rays. While the code is based on current standard and established theory of solar modulation of galactic cosmic rays, it is far more computationally demanding than what a typical application oriented study may require. The purpose for developing such a code was to afford the group a fully three dimensional solar modulation model by which a computationally efficient parametric set of simulated data can reliably and efficiently be developed. This development should afford the group both qualitative and quantitative advantage in this regard and relative to modulation codes currently available to the group which tend to be rudimentary one dimensional codes. The report is in 4 sections: (1) description of the basic physical model the new three dimensional transport code is based upon, (2) numerical implementation and various algorithms of the code, (3) sample calculations and comparison to available data, and (4) direction and recommendations for future work.

DTIC

Galactic Cosmic Rays; Computer Programs; Three Dimensional Models

19980009294 Weizmann Inst. of Science, Rehovot, Israel

The Weizmann Institute of Science: Scientific Activities 1996

Efrat, Susan, Editor, Weizmann Inst. of Science, Israel; 1996; ISSN 0083-7849; 454p; In English; No Copyright; Avail: CASI; A20, Hardcopy; A04, Microfiche

Contents include the following: Applied Mathematics and Computer Science, Theoretical Mathematics, Condensed Matter Physics, Particle Physics, Physics of Complex Systems, Chemical Physics, Environmental Sciences and Energy Research, Materials and Interfaces, Organic Chemistry, Structural Biology, Solar Research Facilities Unit, Chemical Services, Biochemistry, Membrane Research and Biophysics, Molecular Genetics, Plant Genetics, Biological Services, Immunology, Molecular Cell Biology, Neurobiology, Experimental Animals Center, Science Teaching, and Libraries.

Derived from text

General Overviews; Biochemistry; Energy Technology; Immunology; Molecular Biology; Organic Chemistry; Theoretical Physics

19980010021 Evans (Charles) and Associates, Redwood City, CA USA

Summary Report: Defense Sciences Research Council Summer Conference Final Report

Jul. 1997; 282p; In English

Contract(s)/Grant(s): N00014-92-C-0143; DARPA Order 8884

Report No.(s): AD-A330005; CEVANS/084/SR-97-52; No Copyright; Avail: CASI; A13, Hardcopy; A03, Microfiche

This report is a summary of the 1997 DARPA-Defense Sciences Research Council Summer Conference held from July 8, through July 31, 1997, in La Jolla, California. The report is submitted to DARPA soon after the conference to allow timely utilization of the results from the conference workshops. During the year, workshops and program reviews are attended by smaller groups of Council members. These reports are made directly to DARPA and are included in the report submitted at the end of the contract year. The principal task of the ONR-DARPA Contract is to bring together a group of the country's leading scientists and engineers for an extended period, to permit them to apply their combined talents in studying and reviewing future research areas in defense sciences for the Department of Defense. The technical direction of the Council is by a Steering Committee comprised of seven representative members of the Council who work with DARPA management to select the relevant topics for the annual Summer Conference, and with the Council membership to develop new areas in defense research. The Council also serves as a resource for other DARPA offices. The membership of the Steering Committee and the Council varies from year to year in response to the research areas of major interest to the Department of Defense. The 1997 Steering Committee membership is given on the following page and the 1997 Council membership is given on pages v-vii.

DTIC

Defense Program; Engineers; Scientists

19980010036 Air Force Office of Scientific Research, Bolling AFB, Washington, DC USA

Research Interests of the Air Force Office of Scientific Research and Broad Agency Announcement 98-1

Nov. 26, 1997; 62p; In English

Report No.(s): AD-A332020; No Copyright; Avail: CASI; A04, Hardcopy; A01, Microfiche

The Introduction describes the Broad Agency Announcement (BAA), the mechanism AFOSR uses to solicit research proposals. It also provides an overview of the general approach used to submit proposals. AFOSR's foreign research offices, in London (the European Office of Aerospace Research and Development - EOARD) and Tokyo (the Asian Office of Aerospace Research and Development - AOARD) also employ this BAA. EOARD and AOARD manage programs that provide access to international research and research organizations of interest to the Air Force and other DoD organizations. In fiscal year 1996, EOARD and AOARD awarded 3 contract and grants totaling \$3.5M to research universities and institutions from African, Asian, European, Middle Eastern, and Pacific Rim countries. (See EOARD and AOARD homepages for more information.) The New World Vistas (NWV) section describes the NWV reports on science and technology needed to support six future Air Force capability areas: Global Awareness, Dynamic Planning and Execution Control, Global Mobility in War and Peace, Projection of Lethal and Sub-lethal Power, Space Operations, and People.

DTIC

Aerospace Systems; Research and Development; International Cooperation

19980010106 Nanjing Univ. of Aeronautics and Astronautics, Nanjing, Jiangsu, China

Journal of Nanjing University of Aeronautics and Astronautics, Volume 28 Monthly Report

Zhang, A., Nanjing Univ. of Aeronautics and Astronautics, Nanjing, China; Feb. 1996; 150p; In Chinese; Portions of this document are not fully legible

Report No.(s): PB96-156583; Copyright Waived; Avail: Issuing Activity (Natl Technical Information Service (NTIS)), Microfiche

Partial Contents: (1) A System of Multi-Modal Logic Based on Medium Logic; (2) Learning the Concept of Stable-Stack of 3-D Objects; (3) Generalization of Marty's Criterion for Normality; (4) Rational Bicircular Arcs and Their Application to CAD; (5) Research on GPS/DNS Integrated Navigation System; (6) and Design of Pitch Control System for Rotor Model Experiment. NTIS

Signal Processing; Digital Navigation; Robotics; Structural Members

19980010658 Manchester Coll. of Science and Technology, UK

UMIST 1995-96 Annual Report

1996; 36p; In English; No Copyright; Avail: Issuing Activity (UMIST, PO Box 88, Manchester M60 1QD, UK), Hardcopy, Microfiche

Amongst the most pleasing events of the year was winning the first UK National Award for Technology Transfer, adding further to the list of awards to UMIST. In reality it was also an acknowledgement of the business start-up activity of UVL, which has brought ten spin-off companies on stream in the past four years. This was backed in the summer by the news that we had won a share of three of the twenty four Technology Foresight Challenge projects. They link universities and industry in developing technologies which may be future competitive winners. Not all of them will be but we are very much at the forefront of national consciousness in these matters as a university which 'delivers'. In the late winter we received news that the Engineering and Physical Science Research Council awards of studentships and grants put us very close to the top of this particular tree and once again we vied with Cambridge as the most popular university from which major employers recruit. Perhaps the most heartening news of all came towards the close of the academic session with the news of an ERDF grant of 3.25 million pounds which ensures that the School of Management will have its new building and that the Federal School of Business and Management will have a focal point. On a more sombre note, we received a grant from the HEFCE of just under 26 million pounds for the 1996/97 session which was 4.6% down on the year covered by this Report. This compares with an average reduction for the sector as a whole of 2.3% and is amongst the highest reductions suffered by any university. For the first time, the grant announcement combines formula capital allocation with the basic teaching and research grant. Given the average 31% cut in capital funding, it is evident that, when the capital grant is combined with the basic grant, those universities with traditionally high equipment allocations (such as Cambridge, Imperial, UMIST, Oxford) have suffered more than most in the year on year per cent comparison.

Derived from text

Universities; Management Methods; Education; Commerce; Technology Transfer; Industries

19980011606 NASA Washington, Washington, DC USA

Aeronautics and Space Report of the President: Fiscal Year 1996 Activities

1996; 136p; In English

Report No.(s): NASA/TM-97-112942; NAS 1.15:112942; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

Topics considered include: (1) Space launch activities: space shuttle missions; expendable launch vehicles. (2) Space science: astronomy and space physics; solar system exploration. (3) Space flight and technology: life and microgravity sciences; space shuttle technology; reusable launch vehicles; international space station; energy; safety and mission assurance; commercial development and regulation of space; surveillance. (4) Space communications: communications satellites; space network; ground networks; mission control and data systems. (5) Aeronautical activities: technology developments; air traffic control and navigation; weather-related aeronautical activities; flight safety and security; aviation medicine and human factors. (6) Studies of the planet earth: terrestrial studies and applications: atmospheric studies: oceanographic studies; international aeronautical and space activities; and appendices.

Derived from text

Congressional Reports; Space Shuttle Missions; Space Communication; Space Exploration; Spacecraft Launching; Communication Satellites

19980011996 Naval Surface Warfare Center, Dahlgren, VA USA

Naval Surface Warfare Center Dahlgren Division Technical Digest 1997 Issue

Jan. 1997; 139p; In English

Report No.(s): AD-A332934; NSWCDD/MP-97/97; No Copyright; Avail: CASI; A07, Hardcopy; A02, Microfiche

In short, four thrusts associated with future strategic systems have been identified: maintenance of the industrial base, improved planning systems, modernization and life extension of existing systems, and the expansion of the strategic mission. Specific articles related to these four thrusts include: (1) The Reentry Systems Application Program, (2) Wind Tunnel Testing of Strategic Systems, (3) Evaluation of Reentry Systems Nosetips and Heatshields Using an Arc Heater Facility, (4) Moving Mass Roll Control for Fixed Trim Reentry Bodies, (5) FREE Algorithm for Solution of an SLBM Multiple Constraint Mission Problem, (6) Fuzzy Logic Based Expert System Solutions to Sequencing and Grouping Problems, (7) High Altitude Electromagnetic Pulse (HEMP), (8) Developing Software for a Distributed, Synchronous, Real Time System, (9) Point Mass, Dipole, and Quadrupole Gravity Modeling for FBM Systems Support, (10) Computation of Ballistic Parameters for SLBM and (11) Advanced Technology Demonstration of the Naval Tactical Missile System (NATACMS).

DTIC

Algorithms; Arc Heating; Computer Programs; Electromagnetic Pulses; Expert Systems; Fuzzy Systems; Real Time Operation

Subject Term Index

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